

GENERAL

- 967 Muller (E). About the development of methods of planning, recording and account of the quality of foodstuffs. *Lebensmittelindustrie* 36(4); 1989; 148
- 968 Newmann (R) and Kagelmann (G). Requirements to quality assurance at the manufacture of foodstuffs. *Lebensmittelindustrie* 36(4); 1989; 145-147 (De).

FOOD PROCESSING

Nil

FOOD PACKAGING

Packaging materials

Plastics

- 969 Taneja (SL). Role of plastic. Aseptic packaging and rural development. *Packaging India* 22(1); 1989; 16

FOOD ENGINEERING AND EQUIPMENT

Engineering

- 970 Fryer (PJ). The uses of fouling models in the design of food process plant. *Journal of the Society of Dairy Technology* 42(1); 1989; 23-29

The problems caused by fouling are outlined, and recent work to understand the processes of fouling reviewed. Fouling is a two-stage process; the reactions governing the first stage are unclear, but the second stage appears to be governed by protein aggregation in the bulk fluid. The use of a computer model for fouling in simulating heat exchanger behaviour is described: it is possible to select an exchanger with an optimal fouling response. The need for accurate fouling and cleaning kinetics is stressed, and the role of a process monitor outlined. AS

- 971 Karathanos (VT), Villalobos (G) and Saravacos (GD). Comparison of two methods of estimation of the effective moisture diffusivity from drying data. *Journal of Food Science* 55(1); 1990; 218-223, 231

The effective moisture diffusivity (D) in starch materials was estimated by the method of slopes of the drying curve and a computer simulation technique. Drying data (moisture vs time) were obtained on slabs and spherical samples of hydrated and gelatinized starches in an air-dryer operated at 60-100 °C and air velocity 2 m/sec. The two methods gave similar results in high-amylopectin starch gels of low porosity, where liquid diffusion might predominate during drying. Considerable differences between the two methods were found in hydrated granular starches and in porous high-amylose gels, where vapour diffusion might be the main water transport mechanism. AS

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

- 972 Frindik (O). Thorium contents in soils, vegetables, cereals, and fruits. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(3); 1989; 236-240 (De).

Thorium contents (alpha-activities of the naturally occurring isotopes Th-228, Th-230, and Th-232 were determined in soils, vegetables, cereals, and fruits. The thorium content of plants depends on the degree of contamination by soil resuspension and thus on the specific surface of the plants. The activity of the isotope Th-230 is almost the same as that of the main isotope Th-232. Th-228, with about the same activity as Th-232 in soil, increases to about 10-fold the activity in vegetables, 29-fold in sweet chestnuts and 740-fold in Brazil nuts. Thorium concn. factors from the soil to these vegetable products are calculated; they include the total concn. not only the soluble portion of thorium. AS

- 973 Hudson (GJ). Using a domestic microwave oven for the measurement of water in food. **Nutrition Reports International** 40(1); 1989; 67-70

A domestic microwave oven was used to measure the water content, a useful index of protein and energy content, of more than 8000 samples of cooked food in three villages in the Gambia, West Africa. The microwave oven offers several advantages over conventional freeze-dryers; it is inexpensive, small and maintenance-free. Values for water content are obtained within a few min., in contrast to the many h required for freeze-drying. AS

- 974 O'Brien (J) and Morrissey (PA). Nutritional and toxicological aspects of the Maillard browning reaction in foods. **CRC Critical Reviews in Food Science and Nutrition** 28(3); 1989; 211-248

This review covers the chemistry of Maillard browning, factors affecting the rate of Maillard browning (moisture content and physicochemical state of the food system, pH, miscellaneous factors affecting the rate of Maillard browning). Nutritional consequence of Maillard browning (distribution and loss of essential amino acids, distribution of ascorbic acid, decreased protein digestibility effect of Maillard reaction products on digestive enzymes, mineral interactions of Maillard reaction products), consideration of analytical methods to monitor the Maillard reaction (chemical methods, rat bioassay, microbiological assays, immunoassays), toxicological aspects of maillard Brwoning (gross toxicological effects of Maillard reaction products, metabolism and toxicokinetics of Maillard reaction products, cytotoxicity, mutagenicity of Maillard reaction products, nitrosation of intermediates and products of the Maillard reaction, effect of Maillard reaction products on gut microflora, allergenicity), and future developments. 312 references. SRA

Chemistry(Analytical)

- 975 Cervera (ML), Catala (R), Monotoro (R) and Ybanez (N). Determination of cadmium, copper, lead and zinc in foodstuff and brines by flame atomic absorption spectroscopy. **Revista de Agroquimica Y Tecnologia de Alimentos** 29(1); 1989; 117-123 (Es).

A method for detn. of Cd, Cu, Pb, and Zn in foodstuff brines has been developed. After dry mineralisation of samples

the complexes formed with ammonium-pyrrolidine dithiocarbamate were extracted with 4-methyl-2-pentanone. Final detn. was done by flame atomic absorption spectrophotometry. Detection limits (expressed in ng/g of foodstuff brine) were: Cd, 0,8; Cu, 3; Pb, 15, and Zn, 15. Values found for precision (coeff. of variation for 6 independent analyses on the same sample) were: Cd, 18%; Cu, 21%; Pb 6%, and Zn, 3%. Recovery percentages (with confidence intervals at $p = 0.05$) were: Cd, 113 plus or minus 5%; Cu, 108 plus or minus 10%; Pb, 123 plus or minus 4%, and Zn 104 plus or minus 9%. AS

- 976 Dobarganes (Mc) and Perez-Camino (MC). Systematic evaluation of heated fats based on quantitative analytical methods. *Journal of the American Oil Chemist's Society* 66(10); 1989; 1509

- 977 Rodel (W) and habisch (D). Studies on the identification of volatile compounds formed by heating of partially hydrolyzed gelatin and glucose. *Die Nahrung* 33(5); 1989; 449-456

The volatile compounds of a Maillard products with cocoa-like flavour formed by thin-layer roasting of partially hydrolyzed gelatin and glucose are investigated using gas chromatography/mass spectrometry. A total of 53 compounds from different chemical classes is identified. The odour sensations of the GC-eluates obtained by "sniffing" speak for the responsibility of pyrazines, carbonyl compounds and sulphides for the flavour complex. AS

FOOD MICROBIOLOGY AND HYGIENE

Bacteria

Lactobacillus casei

- 978 Lee (SY) and Lee (BH). Esterolytic and lipolytic activities of *Lactobacillus casei* subsp-Casei LLG. *Journal of Food Science* 55(1); 1990; 119-122, 126

The esterolytic and lipolytic enzymes were produced by cell lysis of *Lactobacillus casei* subsp Casei LLG during the late logarithmic growth phase. The enzyme was purified to 67 fold by ion exchange chromatography and gel filtration chromatography using the FPLC system. Polyacrylamide gel electrophoresis and sodium dodecyl sulphate-polyacrylamide gel electrophoresis using the "Phast" system of the purified enzyme

showed a single protein band for butyrate-esterase (3.2×10^5 Dalton), caproate esterase (1.1×10^5 Dalton) and caprylate esterase (4.0×10^4 Dalton), resp. The max. lipolytic activity was observed at pH 7.2 and 37 C. The enzyme activity was inhibited by silver and mercury ions by Mg and Ca stimulated lipolytic activity. The K_m and V_{max} values for esterase-lipase of the strain LLG were $76 \mu M/min/mg$ of protein, and 0.57 mM, resp. This enzyme was stable at room temp. for at least 2 days. AS

Listeria monocytogenes

- 979 Boyle (DL), Schmitdt (GR) and Sofos (JN). Growth of *Listeria monocytogenes* inoculated in waste fluids from clean-up of a meat grinder. *Journal of Food Science* 55(1); 1990; 277-278

The potential of waste fluids from clean-up of a meat grinder to support growth (8 and 35 C) of artificially inoculated *Listeria monocytogenes* Scott A was examined. Estimated generation times were 10.1 and 2.3 h at 8 C and 8.9 and 2.2 h at 35 C for a fluid collected during rinsing of the meat grinder and a fluid collected from the floor drain, resp. A sanitizer fluid (25 p.p.m. titratable iodine), collected after sanitation of the grinder, inactivated the inoculated cells. Thus, waste fluids may support growth of *L. monocytogenes* in meat processing facilities, but frequent sanitation should inactivate the pathogen. AS

Salmonella typhimurium

- 980 Prusak-Sochaczewski (E) and Luong (JHT). Utilization of two improved enzyme immunoassays based on avidin and biotin interaction for the detection of *Salmonella*. *International Journal of Food Microbiology* 8(4); 1989; 321-333

Based on a strong interaction between avidin and biotin, two enzyme immunoassay have been modified and tested for the detection of *Salmonella typhimurium* in foodstuffs. In both assays, the antigen containing sample was first reacted with antibody to *Salmonella* which was precoated on a polystyrene microtiter plate. The bound antigen was then allowed to react with an appropriate amount of biotinylated antibody. In the first procedure, the present of *Salmonella* was quantified by using peroxidase labeled avidin. In the latter, avidin acted as a bridge between the biotinylated antibody and the biotinylated peroxidase. Samples containing 10^3 and 10^4 cells/ml of the *Salmonella* virulent strain, resp., were

detectable by these two methods. The results thus compared favorably with the detection limit of the standard ELISA (10^5 cells/ml.). The superiority of the modified ELISA's utilizing biotin/avidin interactions was also demonstrated for the detection of *Salmonella* in artificially contaminated food samples inoculated with only 2-5 *Salmonella* cells followed by two incubation steps. No significant interference of *E. coli* (up to 5×10^6 cells/ml) was observed in the quantification of *Salmonella* cells. AS

Staphylococcus aureus

- 981 Batish (VK), Nataraj (B) and Sunita Grover. Effect of vacuum concentration survival and behaviour of *S. aureus* 234. *Journal of Food Science* 55(1); 1990; 269-270

Staphylococcus aureus 234 population was reduced from 18×10^5 cfu/mL to 31×10^4 cfu/mL after 1:3 vacuum concn. of cow's milk. However, the corresponding figures during concn. of buffalo milk were 20×10^5 cfu/mL and 109×10^4 cfu/mL. The ability to produce enterotoxin B was completely lost in all the five variants (survivors) examined. However, coagulase and Thermonuclease (TNase) activities were only slightly decreased as compared to those of the parent strain. The egg yolk clearing by some variants on Baird Parker agar was delayed by 24 h and the colonies were of diffused type. The other activities like phosphatase, gelatin liquefaction, aerobic and anaerobic glucose and mannitol utilization, and hemolysis were not affected in the survivors. AS

Fungi

Aspergillus parasiticus

- 982 Sharma (A), Padwal-Desai (SR) and Nair (PM). Aflatoxin-producing ability of spores of *Aspergillus parasiticus* exposed to gamma-radiation. *Journal of Food Science* 55(1); 1990; 275-276

When compared with the unirradiated spores, gamma-irradiated spores of aflatoxin-producing fungi did not produce more aflatoxin after inoculation on autoclaved rice. The greatest amount of aflatoxin was produced by the inoculum of the colonies obtained from unirradiated spore suspension, whereas, the inoculum of colonies from irradiated spore suspension produced comparatively lower amounts of the toxin in synthetic glucose-salt medium. The studies indicated that

radiation did not increase the aflatoxin-producing potential of the fungus. AS

BIOTECHNOLOGY

- 983 Florkowski (WJ) and Purcell (JC). Commercialization of oilseed biotechnology economic implications for secondary agricultural areas. *Journal of the American Oil Chemist's Society* 66(10); 1989; 000-000

Progress in commercialization of biotechnology in production of oil palm, rapeseed, and soybeans has been remarkable, and the supply of vegetable oils is likely to increase. Some of the new cvs of the oil bearing crops offer an opportunity to expand agricultural production in marginal agricultural areas, but many will cause land diversion to other purposes. The long-term changes in the location of production will depend on the biological nature of the crop (annual vs perennial) and the future changes in demand. Aging populations in developed countries will pay more attention to nutritional qualities of vegetable oils. An increased industrial use of vegetable oil may require breeding for oil characteristics that are useful to industry. AS

TISSUE CULTURE

Nil

FOOD ADDITIVES

- 984 Grinene (EK), Venskutonis (PRJ) and Sudziene (SK). Processing aspects of aroma of some food products and improved technique of analysis of volatile compounds. *Die Nahrung* 33(5); 1989; 443-448

On this basis of results of analysis of compounds correlating with flavour the influence of a complex of factors-qualitative parameters of raw materials and main technological processes-on the formation and preservation of flavour properties of sweet and sour cream butter has been determined. The possibility of desirable formation of butter quality has

been revealed. Further on investigations of the influence of some milk additives on comp. of aroma compounds of wheat bread have been carried out. To isolate the volatiles from bread an improved method of vacuum distillation in a specially designed apparatus has been applied. AS

- 985 Teleky-Vamosy (Gy) and Szepes-Krell (Gy). Investigation on the sensory properties of some taste enhancing food additives. *Die Nahrung* 33(5); 1989; 395-404

The author studied the sensory properties of L-glutamic acid, monosodium glutamate (MSG) and disodium inosin-5'-monophosphate (IMP). The threshold concn. of all the 3 compounds were determined by a dilution method; the relationships between concn. and taste quality by the method of taste description; the relationships between concn. and taste intensity by the Stevens methods of "magnitude estimation". The effect of MSG on the 4 basic tastes (sweet, salty, sour and bitter) was also studied. AS

Stabilizers

Gums

Guar gum

- 986 Umadevi Sajjan (S) and Raghavendra Rao (MR). Functional properties of native and carboxymethyl guar gum. *Journal of the Science of Food and Agriculture* 48(3); 1989; 377-380

Guar gum in its native form exhibits a very good thickening capacity and hence is used as a thickener or agent for 'binding' water in food. This reports the effect of introducing an anionic carboxymethyl group upon the thickening capacity of guar gum and the related secondary functional properties of stabilising foams and suspensions. Compared with native guar gum, carboxymethyl guar gum with a degree of substitution of 0.68 exhibited a higher viscosity and an enhanced ability to stabilise foams and suspensions. Both native and carboxymethyl guar gum induced a non-Newtonian pseudoplastic behaviour to casein (100g liter^{-1}) suspension. At the same time only carboxymethyl guar gum containing suspension above 1 g liter^{-1} exhibited measurable yield value AS

CEREALS

- 987 Borjesson (T), Stollman (U), Adamek (P), and Kaspersson (A). Analysis of volatile compounds for detection of molds in stored cereals. *Cereal Chemistry* 66(4); 1989; 300-304

Volatile fungal metabolites were collected and identified during fungal growth on wheat. This method allows early detection of fungal growth, and representative samples from a large batch of cereals can be taken. The fungi *Aspergillus amstelodami*, *Aspergillus flavus*, *Penicillium cyclopium*, and *Fusarium culmorum* were cultivated on moist wheat (25% MC) in cultivation containers provided with an air inlet and outlet. Volatiles in the headspace gas of the containers were collected on a polymer adsorbent by purging an airstream through the container and were separated and identified by combined gas chromatography and mass spectrometry. The volatile metabolites produced in the greatest quantities were 2-methylfuran, 2-methyl-1-propanol, and 3-methyl-1-butanol. When production of volatiles during different fungal growth phase was investigated, it was found that some compounds were mainly produced during the early stages. The metabolic activity of the fungi was studied by measuring carbon dioxide content in the cultivation containers. Two days after inoculation of fungi, before growth was visually detectable, a rise in the concn. of carbon dioxide and other volatiles was readily measurable. The production of terpenes varied greatly between the examined sp., and these compounds could possibly be used for the recognition of sp. AS

- 988 Chavan (JK) and Kadam (SS). Nutritional improvement of cereals by fermentation. *CRC Critical Reviews in Food Science and Nutrition* 28(5); 1989; 349-400

Reviews nutritional problems associated with cereal grains, fermentation of cereal grains/meals (microflora in natural fermentation, changes in PH, titratable acidity and dry matter, proteins, carbohydrates, lipids, minerals, vitamins, antinutritional factors and functional properties) application of fermented cereal in foods and (traditional foods: Rice based fermented foods:- idli, dosa, anarshe, dhokla, miso, puto, sierra or dry rice, lao-chao, ang-kak, Wheat-based fermented foods:-soy sauce or shoyu, jalebies, kurdi, kushik tarhana, corn-based fermented foods-infera, kisra, ogi, bagobe, feni, ambali), fermented beverages (beers, sake, non-alcoholic

beverages). 224 references. SRA.

- 989 Chavan (JK) and Kadam (SS). Nutritional improvement of cereals by sprouting. *CRC Critical Reviews in Food Science and Nutrition* 28(5); 1989; 401-437

Reviews nutritional and aesthetic constraints in cereals, sprouting of cereal grains (grains for sprouting, factors affecting sprouting methods used for sprouting, biochemical changes during sprouting), Protein quality of sprouted cereals and utilization of sprouted cereals in foods (food uses, traditional foods, bakery products and weaning foods). 172 references. SRA

- 990 Li (YZ) and Posner (ES). An experimental milling technique for various flour extraction levels. *Cereal Chemistry* 66(4); 1989; 324-328

With the objective of producing flours more representative of those milled commercially, an experimental milling technique is described to obtain 74, 76, 78, 80 and 82% flour extraction. The corresponding flow sheets presented make use of this batch type experimental milling unit. Milling results show that this technique can give high reproducibility and acceptable variance between samples. Both ash content and colour grade of the straight-grade flours from hard red winter wheat showed a linear relationship with the extraction level. A methodology for evaluation of wheat milling qualities is proposed. AS

Barley

- 991 Newman (RK), Newman (CW) and Graham (H). The hypocholesterolemic function of barley beta-glucans. *Cereal Foods World* 34(10); 1989; 883-886

The glucans present in barley has been reported to reduce the cholesterol level in human beings. PHR

- 992 Ostergard (K), Bjorck (I) and Vainionpaa (J). Effects of extrusion cooking on starch and dietary fibre in barley. *Food Chemistry* 34(3); 1989; 215-227

Wholemeal barley flour was extruded in a twin-screw extruder under different process conditions and the effects of extrusion on degree of gelatinization, content of starch and dietary fibre as well as the enzymic availability of starch were examined. Although in general starch in extruded samples

was highly susceptible to enzymic digestion *in vitro*, a decrease in starch recovery during enzymic analysis was observed in some samples. The decrease was accompanied by an increase in the fibre fraction. However, this increase did not account for the total starch loss, probably due to formation of undigestible starch fragments too small to precipitate in the 80% ethanol used in the fibre assay. AS

Oats

- 993 Karunajeewa (H), Tham (SH), Brouwer (J-B) and Barr (AR). Lipid and fatty acid composition of oat *Avena sativa* cultivars grown in three Australian states. *Journal of the Science of Food and Agriculture* 48(3); 1989; 339-345

The free and bound lipid content, and the fatty acid comp. of these lipids, in 11 oat (*Avena sativa* L) cvs grown in three Australian states were determined. There were significant differences between cvs in both the free and bound lipid content and in the proportion of fatty acids in these lipids. The proportion of linolenic acid in the lipids of some oat cvs grown in Western and South Australia was greater than that in the same cvs grown in Victoria. There was a positive correlation between the free lipid content and the proportion of linoleic acid in the Swan cv. AS

- 994 Saastamoinen (M), Kumpulainen (J) and Nummela (S). Genetic and environmental variation in oil content and fatty acid composition of oats. *Cereal Chemistry* 66(4); 1989; 296-300

Oil content and fatty acid comp. of oat var. and breeding lines were studied in nine trials at six locations in two yr. All samples contained palmitic, stearic, oleric, linoleic, linolenic, and eicosenoic acid. Myristic, palmitoleic, arachidic, and erucic acids were found in most samples at low concn. Low growth temp. increased the overall lipid synthesis; 65.2% of the variation in oil content could be explained by mean temp. of growing time of oat var. or lines. Low temp. increased the synthesis of oleic and linoleic acids and decreased the concn. of palmitic, stearic, and erucic acids. Small but significant differences in oil content and fatty acid comp. were found between the oat var. studied. Lower linoleic acid concn. was associated with higher oleic acid concn. Especially high negative correlations were found between oleic and linoleic acid contents in different trails ($r = -0.755$, $P < 0.05$; to $r = -0.911$, $P < 0.001$), which can be explained by the synthesis of linoleic acid by successive desaturation from

oleic acid. Significant negative correlations, prevailed, also between oleic and linolenic acid ($r = -0.401$ to -0.832 , $P < 0.01$) and stearic and elconsenoic acid ($r = -0.019$ to -0.833 , $P < 0.001$) concn. The correlation coeff. between linoleic and linolenic acid concn. were positive ($r = 0.278$ to 0.714 , $P < 0.05$). AS

- 995 Wood (PJ), Anderson (JW), Braaten (JT), Cave (NA), Scott (FW) and Vachon (C). Physiological effects gamma, beta-D-glucan rich fraction from oats. *Cereal Foods World* 34(10); 1989; 878-882

The review article deals with various physical as well as physiological properties of the beta glucan fraction of oats. The authors have highlighted that soluble dietary fiber of oat mainly (1-3) (1-4) -beta-D-glucan is physiologically active and may be a beneficial component of oat products in the human diet. PHR

Oat bran

- 996 Oakenfull (D). Oat bran and cholesterol. *Food Technology in Australia* 41(9); 1989; 934

Investigations have shown that rolled oats or oat bran produce lower plasma cholesterol levels in human. In one such study human volunteers eating 100 g of oat bran per day experienced 14-23% fall in blood cholesterol levels. It is also indicated that between 60 and 100 g of oat bran is required per day to produce any significant drop in blood cholesterol. SRA

Rice

- 997 Del Mundo (AM), Kosco (DA), Juliano (BO), Siscar (JJH) and Perez (CM). Sensory and instrumental evaluation of texture of cooked and raw milled rices with similar starch properties. *Journal of Texture Studies* 20(1); 1989; 97-110

Three pairs of milled rices with similar starch properties (low gelatinization temp. waxy, and low gelatinization temp. low amylose, and intermediate gelatinization temp. intermediate amylose) were assessed for cooked rice properties by industry taste panels and for raw and cooked rice properties by 30-member Filipino consumer panels. Only slight differences in texture within pairs were noted by the two industry taste panels who had not been trained to assess boiled raw rice or waxy rice. The Filipino consumer panel gave significantly higher ranked scores for one low-amylose variety in both

and cooked forms. Malagkit Sungsong suman sa antala was ranked higher than modern waxy rices. Instrumental methods for translucency and whiteness of raw rice and Instron hardness and stickness of cooked rice were not able to detect differences perceived by the Filipino consumer panels. AS

- 998 Mahanta (CL) and Bhattacharya (KR). Thermal degradation of starch in parboiled rice. *Starch/Starke* 41(3); 1989; 91-94

Raw and variously parboiled Intan rice (intermediate-amylose var.) starch was fractionated in Sepharose CL-2B column into a larger-molecule (Fr I) and a smaller-molecule (Fr II) fraction. The amount of Fr I decreased and that of Fr II increased in parboiled as compared to raw rice, the extent of change increasing with increasing severity of processing. The proportion of polysaccharide and amylose* in Fr I decreased from 70% and 40% of total, resp., in raw rice to 16% in parboiled rice prepared by 3 kg/cm² gauge steam pressure. Simultaneously, Lambda of its iodine complex increased from 570 to 588 nm in Fr I and decreased from 635 to 620 nm in Fr II. The change was marginal or low after steaming at ambient pressure or after sand roasting. The data show that thermal degradation of starch must be considered as another contributor, in addition to starch gelatinization and reassociation, to the peculiar properties of parboiled rice. AS

- 999 Takahashi (H), Yazaki (H), Manabe (M), Matusuura (S) and Kimura (S). Distribution of aflatoxin, citrinin, and invading fungal mycelium in rice kernels inoculated with *Aspergillus flavus* and *Penicillium citrinum*. *Cereal Chemistry* 66(4); 1989; 337-341

The distribution of fungal mycelium and the mycotoxins aflatoxin and citrinin in individual brown rice kernels were studied. Brown and milled rice kernels were inoculated with *Aspergillus flavus* and *Penicillium citrinum* and stored at about 85 and 90% relative humidity (rh) at 28 C. Significant amounts of aflatoxins were produced by *A. flavus* in the rice stored at 85% rh for 60 days; no citrinin was detected from *P. citrinum* after 60-90 days under the same conditions. In contrast, both fungi synthesized the mycotoxins in large quantities at 90% rh for 16-60 days. Both mycotoxins were near the invading mycelia of their fungi, which were present primarily in the germ, aleurone layer, and starchy endosperm in the highly fungus-damaged rice. The mycotoxins originally present in moldy brown rice decreased during milling but were

not completely removed from highly damaged kernels. AS

- 1000 Vaingankar (NM) and Kulkarni (PR). A cooking quality parameter as an indicator of adulteration of Basmati rice. *Journal of the Science of Food and Agriculture* 48(3); 1989; 381-384

Among various cooking quality parameters, different length/breadth ratio has been found to be a reliable indicator of adulteration of Basmati rice, with improved sabarmati, Pusa-169, PR-106, Kali-much, Lakra and Parimal, which are the rice var. used frequently for adulteration. A min. value of length/breadth ratio of 3.92 plus or minus 0.09 to 4.09 plus or minus 0.09 was found to be indicative of pure Basmati. AS

Rice flour

- 1001 Normand (FL) and Marshall (WE). Differential scanning calorimetry of whole grain milled rice and milled rice flour. *Cereal Chemistry* 66(4); 1989; 317-320

The thermal properties of whole grain milled rice and milled rice flour were investigated by differential scanning calorimetry. Thermal curves were obtained on representative long, medium, short, and very low amylose var. over the temp. range of 20 to 110 C. All whole grain samples showed two endothermic transitions associated with starch gelatinization whereas comparable flour samples exhibited only one endotherm. The gelatinization temp. for all long, medium, and short var. decreased with decreasing grain length. Gelatinization onset temp. for all samples were similar within each var. but peak gelatinization temp. were 13-17 C higher in the whole grain samples. Gelatinization enthalpies were about 40% greater in whole grain rice compared to rice flour for each var. Heating rate studies conducted on the long-grain var. (Lemont) at rates of 0.17-1.33 C/min (10-80 C/hr) continued to show two gelatinization endotherms, although some thermal parameters changed with heating rate. The results show that the thermal curves for whole grain rice are considerably different from comparable flour samples, and these results are discussed in terms of the structural integrity of whole grain rice in determining its thermal properties. AS

Wheat

- 1002 Huebner (FR). Assessment of potential breadmaking quality of hard spring wheats by high-performance liquid chromatography of gliadins year two. *Cereal Chemistry* 66(4); 1989; 333-337

There is a need for a quick analysis to determine breadmaking quality of small wheat samples for the breeding of new wheat var. Reversed phase high-performance liquid chromatography previously revealed a relationship between a specific fraction found with gliadins and breadmaking quality of wheat var. This relationship was examined a second yr for hard red spring wheats grown in different locations. Observed correlation coeff. between the amount of this fraction and a general quality score based on 20 variables were significant at the 5 or 1% level for wheats from individual locations. For samples combined from different locations, however, correlation decreased significantly. This method may permit analysis of breadmaking potential of a new wheat genotype using as little as one-half kernel of wheat, possibly eliminating the growing of thousands of plants (for each var. developed) during a period of two or three yrs. AS

- 1003 Kahlon (TS). Nutritional implications and uses of wheat and oat kernel oil. *Cereal Foods World* 34(10); 1989; 872-875

The author has reviewed the properties of wheat germ and oat kernel oils. The beneficial effects of using wheat germ oil in the diet were relatively reviewed wheat germ oil was found to reduce the cholesterol level improved the endurance and physical fitness in athletes and increased the fertility rate. PHR

- 1004 Lookhart (GL), Menkovska (M) and Pomeranz (Y). Polyacrylamide gel electrophoresis and high-performance liquid chromatography patterns of gliadins from wheat sections and milled and air-classified fractions. *Cereal Chemistry* 66(4); 1989; 256-262

Gliadins were extracted from hard red winter wheat samples, cv Vona, that ranged in protein contents from 9.5 to 14.8% from lab. milled and hand-dissected fractions from the hard red winter wheat; and from-air classified flours from a commercial blend of wheat flours. The gliadin extracts were obtained both from bulk wheat samples and from individual kernels. The gliadin fractions were analyzed by polyacrylamide gel electrophoresis (PAGE) and high-performance liquid chromatography (HPLC). Extract aliquots were analyzed (by PAGE and HPLC) both on a constant sample wt. and constant sample protein basis. In evaluating the electrophoregrams and elution patterns, relative PAGE band intensities and HPLC elution peaks and their ratios were studied. Small differences in the gliadin PAGE and HPLC patterns were found in flour mill stream

fractions and by-products of a single wheat var. Vona, and in air-classified wheat flour fractions with wide variations in wheat protein (bulk samples). Considerable differences in PAGE and HPLC patterns were found in hand-dissected fractions. Qualitative and quantitative variations in PAGE and HPLC patterns were observed among single kernels of this wheat cvs., which indicates gliadin heterogeneity (biotypes). AS

- 1005 Domah (BD) and Lefkovitch (LP). Optimal oxidant requirement of wheat-oat composite flours. *Die Nahrung* 32(6); 1988; 527-538

A series of exp. were used to study the combinations of oxidants (ascorbic acid and/or potassium bromate), water and oat flour in a composite maximizing loaf volume. Differences in yeast batches dominated the oxidative requirements of composite flours. Only oat flour significantly reduced loaf vol. whereas water tended to increase it. At 68-72% moisture content, optimum loaf volume needed only potassium bromate without ascorbic acid, and oat flour had no effect on these oxidative requirements. At 64% moisture content, the oxidant requirement depended heavily on the level of oat flour in the composite. At 61.6% water level, there was a high tolerance of loaf vol. to potassium bromate. Our observations indicate that loaf vol. of 0-15% wheat oat composites can be optimized by a sufficiently high water level in the dough, coupled with controlling the oxidative action of yeast fermentation. AS

Wheat bran

- 1006 Aoe (S), Nakaoka (M), Ido (K), Tamai (Y), Ohta (F) and Ayan (Y). Availability of dietary fiber in extruded wheat bran and apparent digestibility in rats of coexisting nutrients. *Cereal Chemistry* 66(4); 1989; 252-256

Effects of extrusion cooking on availability of dietary fiber in wheat bran and the apparent digestibility in rats of coexisting nutrients (starch, protein, and fat) were studied. The content of soluble fiber was 3.3% in raw wheat bran, which increased in relation to the degree of extrusion to 4.2% after moderate extrusion and 5.1% after excessive extrusion. Scanning electron microscopic observations showed that the cell wall of extruded products were thinner and their surface rougher than those of the raw material. Apparent digestibility of starch, protein, and fat was not influenced by extrusion cooking, whereas that of the wheat bran dietary fiber was increased significantly in rats ($P < 0.05$). Even in the group fed a diet containing raw wheat bran, the honeycomb-li

structure of fecal dietary fiber was disordered after passage through the rat alimentary tract. Dietary fiber in the rats fed the extruded products was also greatly disrupted; cell walls and inner surfaces were wrinkled, and the remaining pericarp layers were often greatly folded or curled. The present study suggests that extrusion cooking of wheat bran is effective in modifying its physicochemical form and the availability of dietary fiber in rats. AS

- 1007 Schwarz (PB), Youngs (VL) and Shelton (DR). Isolation and characterization of lignin from hard red spring wheat bran. *Cereal Chemistry* 66(4); 1989; 289-295

Dioxane-extractable lignin (DEL) preparations were isolated from hard red spring (HRS) wheat bran (bran DEL) and HRS wheat outer pericarp tissue (pericarp DEL). Alkali lignin was prepared from the bran (bran AL). Prior to lignin extraction, the bran and outer pericarp tissues were treated to remove nonlignin materials. Treatments included pin milling, air classification, and enzymatic digestion. Bran DEL contained 0.86% nitrogen and 18% carbohydrate, whereas the bran AL and pericarp DEL contained, resp. 1.95 and 1.06% associated nitrogen and 0.9 and 2.2% associated carbohydrate. Esterified hydroxycinnamic acids were detected in the bran DEL preparation. These consisted largely of trans-ferulic acid with lesser amounts of trans-p-coumaric acid. Ultraviolet spectroscopy indicated the absence of these compounds in the bran AL and pericarp DEL isolates. Bran DEL was characterized by nitrobenzene oxidation. The mol. wt. distribution of the bran DEL and AL isolate were determined by gel permeation chromatography. The bran AL isolate had a high average mol. wt. whereas that of the bran DEL isolate was quite low. All lignin preparations were obtained only in low yields, perhaps representing less than 5% of the total tissue lignin. AS

Wheat flour

- 1008 Haridas Rao (P), Leelavathi (K) and Shurpalekar (SR). Effect of damaged starch on the chapati-making quality of whole wheat flour. *Cereal Chemistry* 66(4); 1989; 329-333

Effect of damaged starch on the functional quality characteristics of whole wheat flour used for chapatimaking was studied. Damaged starch in the flour was positively correlated to the diastatic activity ($r = 0.884$, $P < 0.01$) and chapati water absorption ($r = 0.955$, $P < 0.001$) and negatively correlated to the percentage overtailings on a 10 XX sieve ($r =$

-0.938, $P < 0.001$). The various rheological characteristics of whole wheat flour were also influenced by the damaged starch as indicated by its significant correlation to dough development time ($r = -0.924$, $P < 0.001$), extensibility ($r = 0.883$, $P < 0.01$), resistance to extension ($r = 0.899$, $P < 0.001$), cohesiveness ($r = 0.835$, $P < 0.01$), and adhesiveness ($r = 0.732$, $P < 0.01$). The flour with damaged starch in the range of 14.1-16.5% was considered to be optimum, as it yielded chapatlies with better pliability, texture, taste and overall acceptability. AS

- 1009 Navickis (LL). Rheological changes of fortified wheat and corn flour doughs with mixing time. *Cereal Chemistry* 66(4); 1989; 321-324

Rheological properties of doughs blended from wheat and corn flours fortified with vital wheat gluten were measured on rested doughs for a series of mixing times (at increasing work energy inputs) all at the same water content. As mixing time increased, the vol. of loaves baked from these doughs increased to a max., then decreased. The shear modulus obtained at small strains (0.2%) increased with mixing time, whereas the relaxation time generally decreased. The dynamic storage modulus G' increased with mixing time while the loss modulus G'' decreased. The ratio G''/G' was close to 1.0 at the mixing time that gave the greatest loaf vol. This ratio (1.0) shifted to a longer mixing time at 1% higher water content. The response of these doughs to large torsional deformations was also examined. The max. torque attained at first showed a stiffening dough, followed by less resistance as mixing time increased. The strain corresponding to the max. torque generally decreased until the doughs were mixed well past the point of minimum mobility. A similarity is noted between max. torque values and max. strains of these blended flours and extensigraph measurements reported for all-wheat flours as influenced by mixing times. AS

- 1010 Tsutsui (T). Studies on the fat binding properties of wheat flour. *Journal of Japanese Society for Food Science and Technology* (Nippon Shokuhin Kogyo Gakkaishi) 36(9); 1989; 712-719 (Ja).

To study the effects of properties of wheat flour on its functionality, fat-binding capacity and baking quality were investigated using the flour of Canadian Western No. 1 (1CW) wheat. Gluten from 1CW wheat bound more triglycerides in hydrogenated rapeseed oil, hydrogenated fish oil (mp 43 °C) and

palm oil than in other oils. The bound lipid contained more C and C_{16:0} fatty acids than the original lipid. Bread baked using hydrogenated rapeseed oil, hydrogenated fish oil (mp 43 C) and palm oil possessed higher loaf vol. Loaf vol. increase of each bread linearly correlated to fat-binding capacity of 1 CW-gluten, but negatively correlated to the linolenic acid content of each lipid. AS

Wheat proteins

Glutenins

- 1011 Wieser (H), Seilmeier (W) and Belitz (H-D). Extractability of glutenins with water/alcohol mixtures under reducing conditions. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(3); 1989; 223-228

After the extraction of albumins, globulins and gliadins from defatted wheat flour, the glutenin containing residue was further subjected to extraction under reducing conditions with water/alcohol mixtures. The protein patterns of the extracts and of the residues was characterized by reversed-phase high performance liquid chromatography and sodium dodecyl sulphate polyacrylamide gel electrophoresis. A rather high amount of middle mol. wt. glutenins and of low mol. wt. glutenins was extracted at 4 C with 30%-70% and 50%-70% aqueous ethanol, resp. The high mol. wt. glutenins were subdivided into two groups. The larger subunits (band Nos. 1-5) were extracted with 40%-60% aqueous ethanol at 4 C, whereas the smaller subunits (band Nos. 8-11) according to Krause et al. were not extracted. The same results were obtained with (n-10)% aqueous 2-propanol. By stepwise extraction with 35%, 70% and 50% aqueous ethanol at 4 C, a rather high yield in the glutenins was obtained only with the first solvent. The reduced glutenins appeared to be almost completely soluble in 70% ethanol at 60 C and at pH 3.5. AS

Glutens

- 1012 Fujio (Y) and Lim (J-K). Correlation between the glass-transition point and colour change of heat-treated gluten. *Cereal Chemistry* 66(4); 1989; 268-270

The colour change and the density of heat-treated wheat gluten varies, depending on the treatment conditions. The heat treatment of gluten by comparing colour changes in samples treated under various conditions has been studied. The changes

in colour was dependent on the treatment temp., up to critical temp. specific to the sample. The critical temp., was significantly increased when the moisture content of the samples was reduced. For example, the critical temp. at 13% moisture was 30 C, whereas the critical temp. at 5% moisture was 100 C. Below the critical temp. the degree of colour change was found to be proportional to the treatment temp. The density of heat-treated wheat gluten was proportional to the logarithm of the change in colour. Based on differential scanning calorimetric measurement of wheat gluten at various moisture levels, it was confirmed that the critical temp. determined by the colour change corresponded to the glass transition temp. of the sample. In fact, wheat gluten was transformed into a glassy material by the heat treatment, indicating the creation of noncrystalline (amorphous) molecular orientation. AS

MILLETS

Corn

- 1013 Almeida-Dominguez (NG), Valencia (ME) and Higuera-Ciapara (I). Formulation of corn-based snacks with high nutritive value. Biological and sensory evaluation. *Journal of Food Science* 55(1); 1990; 228-231

Three composite flours were formulated by linear-programming using corn, chickpea, soybean-meal and methionine to meet the FAO-WHO pattern for lysine and sulphur amino acids. Fried snack foods were manufactured with these flours. The experimental products showed higher protein contents (18.11, 15.69, 13.16%) than a commercial corn snack used as control (7.14%). PER values of experimental snacks (2.69, 2.65, 2.54) were not statistically different from that of casein (2.77) ($P > 0.05$). Two of the formulated products (15.69% and 13.16% protein) showed no significant differences from the control with respect to typical odour and flavour, texture and acceptability ($P > 0.05$). These nutritionally-improved products represent a good alternative to commercially available corn-based snacks. AS

- 1014 Fapohunda (SO). Amino acid composition and mycology of *sekete*, a fermented product from *Zea mays* L. *Die Nahrung* 32(6); 1988; 571-575

- 1015 Gibson (SM) and Strauss (G). An assay of molecular mobility in solid corn meal by front face fluorescence anisotropy. *Cereal Chemistry* 66(4); 1989; 310-313

A new technique based on front-face fluorescence anisotropy was developed to study mol. mobilities in solid corn meal samples before and after extrusion cooking. Anisotropy was determined by measuring the polarization of fluorescence of vitamin A, a natural constituent of corn meal, or that of an added probe, calcein. A conventional fluorescence spectrophotometer was modified by constructing a cuvette holder that allowed the cuvette, filled with a powdered sample, to be oriented at variable angles. Positive anisotropy errors due to polarized stray light were measured and allowed for. Negative errors due to depolarization at air-sample interfaces were eliminated by immersing the powdered samples in a liquid of matching refractive index. In uncooked corn meal the anisotropies were low, indicating high mobility of the fluorophore. In corn meal extrudates, the anisotropies increased with increasing extrusion temp. and decreasing moisture, showing loss of mobility. Anisotropy measurement in a simple and rapid method for relating structural changes at the mol. level with process conditions. AS

- 1016 Hsieh (F), Peng (IC) and Huff (HE). Effects of salt, sugar and screw speed on processing and product variables of corn meal extruded with a twin-screw extruder. *Journal of Food Science* 55(1); 1990; 224-227

The effects of screw speed and additives (sugar and salt) on processing and product variables of corn meal extruded with a twin-screw extruder were studied. Higher salt (0-3%) and sugar concn., (0-4%) in the feed decreased the die pressure, % torque and specific energy. But at 6 and 8%, sugar increased the three processing parameters. Higher screw speed (250 vs 200 rpm) decreased die pressure and % torque, but increased specific energy. The addition of salt and sugar enhanced extruded radial and axial expansions, but reduced product bulk density and breaking strength. An increase in screw speed decreased radial expansion and bulk density, but increased axial expansion and breaking strength. AS

- 1017 Zayas (JF) and Lin (CS). Emulsifying properties of corn germ proteins. *Cereal Chemistry* 66(4); 1989; 263-267

Emulsifying capacity and emulsion stability of hexane-defatted corn germ protein obtained by modified and

conventional extraction processes were studied. Defatted corn germ protein obtained by the modified extraction process had higher emulsifying capacity and emulsion stability than that obtained by the conventional process. The highest emulsion stability was obtained with 7% defatted corn germ protein and 40% fat content; 70.39% water was retained by the emulsion. High emulsion stability was obtained as the result of specific protein properties. Increasing fat content in emulsions from 20 to 40% had a positive effect on emulsion stability. Because of its better functional properties, hexane-defatted corn germ protein obtained by the modified process is recommended for utilization as an additive in food products. AS

Corn meal

- 1018 Halek (GW), Paik (SW) and Chang (KLB). The effect of moisture content on chemical properties and texture profile parameters of corn meal extrudates. *Journal of Texture Studies* 20(1); 1989; 43-45

Two corn meal extrudates with initial moisture contents of 22% and 31% W.B. were partially dried to moisture contents from 7% to 31% W.B. and stored in hermetically sealed containers to allow redistribution of the water. Compressive strength, compressive relaxation and instrumental texture profile analyses (fracturability, cohesiveness, springiness, gumminess and chewiness) were measured. Compressive strength increased with decrease in moisture content from 31-15%, reached a max. between 15-10% and then decreased below 10%. Stiffness showed a similar relationship, with the max. occurring between 10-6%. Relaxation modulus increased with decrease in moisture content over the range studied. Relaxation time was a min. at 15% moisture content. Fracturability had a similar relationship to moisture content as that of compressive strength. The textural behaviour was ductile and chewy at moisture contents above 15% but became crisp or crunchy and collapsed with brittle fractures at lower moisture contents. Both compressive properties and texture profile parameters of the corn meal extrudates changed considerably with changes in moisture content. AS

PULSES

- 1019 Radha Ayyagari, Narashinga Rao (BS) and Roy (DN). Lectins,

trypsin inhibitor, BOAA and tannins in legumes and cereals and the effects of processing. *Food Chemistry* 34(3); 1989; 229-238

Most of the legumes and cereals were found to contain lectins, hemagglutinating activity differed when assayed at different temp. (4, 18 and 37 °C). Considerable variation was observed in hemagglutinating activity of different cvs of a sp. Lectin and beta-oxalyl-amino-alanine (BOAA) content of different cvs of *Lathyrus sativus* showed significant variation whereas tannin, trypsin inhibitor and total protein content did not vary much. Cooked foods were found to have lower levels of antinutrients as compared to raw foods. Dry heating did not inactivate the antinutrients. Soaking the seeds in water and processing effectively removed the antinutrients. AS

Beans

- 1020 Paredes-Lopez (O), Harry (GI) and Gonzalez-Castaneda (J). Sensory evaluation of tempeh produced by fermentation of common beans. *Journal of Food Science* 55(1); 1990; 123-126

A tempeh fermented product was prepared from fresh and hard-to-cook (HTC) common beans with the mold *Rhizopus oligosporus*. Fresh samples fermented for 0, 24, and 48 h were used to prepare fried tempeh, atoles and cookies at various substitution levels. Atoles were also prepared with fermented hardened beans. A panel evaluated samples for the sensory variables; appearance, odour, colour, flavour, texture, and acceptability. For fried tempeh, flavour and acceptability were the sensory variables most affected by fermentation, Atoles supplemented with fermented fresh and HTC seeds, had significantly lower ($P < 0.05$) flavour and colour than controls, resp. Interestingly, acceptability of atoles, from both fresh and HTC samples, and of cookies was not significantly different ($P > 0.05$) from the controls. AS

Black gram

- 1021 Changala Reddy (G), Susheelamma (NS) and Tharanathan (RN). Viscosity pattern of native and fermented black gram flour and starch dispersions. *Starch/Stärke* 41(3); 1989; 84-88

The effects of fermentation and added NaCl on aqueous dispersions of black gram flour were studied. After fermentation the apparent viscosities of cold pastes increased significantly over that of native flour dispersions (NFD).

Addition of NaCl caused considerable decrease in apparent viscosities of NFD but only marginal decrease in fermented flour dispersions (FFD). Studies on rheological constants showed that changes brought about in these but fermentation were greater than that exerted by adding NaCl. Brabender viscography indicated that peak viscosity (PV) decreased by both NaCl and fermentation. FFD with salt showed 15% increase in PV over that without salt. FFD with or without NaCl showed greater breakdown (BV) and set back (SV) viscosities, but the values were lower in comparison to NFD. Starch was isolated in 33-35% yield from native and fermented batters. Apparent viscosity in 1M KOH showed increase due to fermentation. Brabender viscography indicated a GT of -81 C for both starches. The PV of fermented starch increased by 13%, BV by 15% and SV by 30% over that of native. Intrinsic viscosity of starch increased considerably while solubility and swelling power increased only marginally after fermentation. AS

Cowpeas

- 1022 Nnanna (IA) and Dixon Phillips (R). Protein and starch digestibility and flatulence potential of germinated cowpeas (*Vigna unguiculata*). *Journal of Food Science* 55(1); 1990; 151-153, 183

In vivo and In vitro methods with experimental rats and commercial digestive enzymes, resp. were used in assessing the protein and starch digestibility and flatulence potential of germinated cowpeas. Germination (24 h at 25 C or 30 C) reduced the flatulence potential of seeds (52 to 77%). In vivo digestibility of starch and protein was also significantly increase by germination. Germination did not affect in vitro protein digestibility, but reduced In vitro digestibility of freeze-dried and 70 C dried starch. Cooking in boiling water significantly increased in vitro protein and starch digestibility of both ungerminated and germinated seed AS

Cowpea paste

- 1023 Bulgarelli (MA) and Beuchart (LR). Functional properties of cowpea paste as influenced by indigenous microflora. *Journal of Food Science* 55(1); 1990; 146-150

The influence of indigenous microorganisms on several functional properties of cowpea (*Vigna unguiculata*) paste was investigated. Six formulas (with and without onion, salt and

pepper inoculated (indigenous microflora) and uninoculated) were prepared and incubated for 24 h at 30 °C. Lactic acid bacterial population were similar to total aerobic microbial populations which increased with time of incubation. Pastes containing salt were associated with high equilibrium moisture contents. As incubation time progressed, pH and emulsion capacity decreased and specific gravity and apparent viscosity increased, while oil and water binding capacity remained unchanged. Formula content and incubation time did not influence the colour of cowpea pastes; however, akara, a deep-fat fried product prepared from the paste, did have a darker colour when made from paste which had been incubated for 24 h. AS

- 1024 Bulgarelli (MA) and Beuchat (LR). Influence of indigenous microflora on some chemical properties of cowpea paste. *Journal of Food Science* 55(1); 1990; 141-145

Cowpea (*Vigna unguiculata*) paste, the principal ingredient in akara, was evaluated to determine the influence of indigenous microflora on chem. characteristics associated with akara quality. Six formulase (with and without onion, salt and pepper), consisting of inoculated 24 h at 30 °C. A strong relationship between time of incubation and increase in titratable acidity was evident for all treatments. Nitrogen solubility and protein degradation increased during incubation. Monosaccharide content increased with incubation for all pastes, while di- and oligosaccharides decreased. No significant changes in thiamin content were observed; however, riboflavin increased for all formulations as incubation progressed. AS

Fababeans

Fababean flour

- 1025 Rahma (EH). Functional and electrophoretic characteristics of fababean (*Vicia faba*) flour proteins as affected by germination. *Die Nahrung* 32; 1988; 577-583

Fababeans (*Vicia faba*) were germinated at room temp. for 3 and 6 days resp. The effect of germination on the protein fractions, protein solubility index, PAGE pattern and some functional properties i.e. emulsification capacity (EC), foaming capacity (FC), foam stability (FS), water and fat absorption capacities of the flour was studied. Germination decreased albumins, globulins and prolamins at different levels

but non-protein nitrogen and glutelins were increased. The protein solubility index was high at both extreme PH values with an isoelectric point (IP) at PH of 4.4-4.5. The solubility of the proteins slightly increased due to germination at all the PH values. PAGE pattern revealed an obvious dissociation and utilization for both fast and slow moving protein fractions during germination. Emulsification and foaming properties vs pH profile were similar to the pattern of solubility vs pH. Both properties were high at acidic and alkaline pH's and the min. values were at pH 4 to 5. Germination process improved EC, FC and FS of the flour in comparison with that of dry bean flour. Water absorption of fababean flours was improved during germination but the fat absorption markedly decreased. AS

Lima beans

- 1026 Ekanayake (A) and Nelson (PE). Effect of thermal processing on lima bean vitamin B-6 availability. *Journal of Food Science* 55(1); 1990; 154-157

Unit operations in lima bean processing were evaluated by their effects on the availability of vitamin B-6. Blanching of rehydrated lima beans resulted in the loss of about 20% of pyridoxine. In the enzymic digests of the heat processed samples, pyridoxal and pyridoxal-5'-phosphate were not found in appreciable quantities. This was interpreted as a loss in availability, because the acid hydrolysates of both the processed and blanched samples showed a difference of only 15% in the pyridoxal content. This showed that although vitamin B-6 was destroyed only to a small extent during thermal processing, its availability was reduced by almost 50%. AS

Pigeon peas

Pigeon pea flour

- 1027 Oshodi (AA) and Ekperigin (MM). Functional properties of pigeon pea (*Cajanus cajan*) flour. *Food Chemistry* 34(3); 1989; 187-191

The functional properties of the seed flour of pigeon pea (*Cajanus cajan*) were studied. Results showed that the flour had a good gelation property and that the elast gelation concn. was 12%. The foaming capacity was found to be 68% while the foam stability was 20%. This foam stability was found to be comparably higher than those of soy flour and sunflower. The emulsion capacity was determined to be 49.4% while the oil and

water absorption capacities were 80.7 and 138% resp. Protein solubility of the flour was also determined and found to be pH-dependent with min solubility at about pH 5. AS

Winged beans

- 1028 Ravindran (G) and Palmer (JK). Comparison of four different methods for the analysis of dietary fiber in winged bean seeds. *Journal of Food Science* 55(1); 1990; 137-140

Two chem. and two enzymatic procedures were evaluated with respect of efficiency of protein removal and consistency in yield and comp. of soluble and insoluble dietary fiber from winged bean seeds. (cvs TPR-2). Considerable variability was observed in the yield and comp. of the fiber fractions, but the results became more consistent when contamination of the non-carbohydrate components (protein, ash and lignin) were accounted for in the calculations. The constituent sugars of polysaccharides were found to be similar in all four methods. Results indicated the need to critically optimize conditions to achieve efficient deproteinization and the need to differentiate "inherent" and "contaminating" protein. AS

- 1029 Sian (NK) and Ishak (S). Effect of pH on formation, proximate composition and rehydration capacity of winged bean and soybean protein-lipid film. *Journal of Food Science* 55(1); 1990; 261-262

The effect of various pHs on winged bean and soybean protein-lipid films formation, proximate comp. and rehydration capacity were studied. Film can only form within a specific range of pH. Films prepared at high pHs (7.5, 9.0, 10.0 and 11.0) contained higher proportions of proteins, ash and carbohydrate but lower proportion of fat than those at pH 6.7, 2.5 and 2.0. Winged bean and soybean films were found to have different pattern of rehydration, however, both tended to absorb more water at high pH. With regard to film formation efficiency, nutritional value (higher protein content) and rehydration capacity, soybean film is better than winged bean film. AS

OILSEEDS AND NUTS

- 1030 Schneider (FH) and Ruttee (V). Fluid bonding in oilseeds I. Bonding-relevant structure elements. *FAT Science Technology*

91(9); 1989; 337-346 (De).

In all stages of oilseed-processing the process-properties of the materials are determined by the content and distribution-profile of fluids (moisture, oil, hexane) bound in solid material. Bonding of fluid can be interpreted as a structure-dependent complex system. As cases in point cotyledons and testa of soybean and rapeseed were investigated. Results indicate intercellular interstices, vascular-bundle-system and fibrous cell walls as relevant for fluid-bonding; intracellular solution enclosed by the cell walls as membrane has a further bonding-effect. Sorption-isothermal-curves are discussed under structural aspects. Part II of this publication will describe the relations between mechanisms of fluid bonding and the structural elements of real solid materials. AS

Cottonseeds

Cottonseed flour

- 1031 Rouanet (JM), Henery (O), Caporiccio (B) and Besancon (P). Comparative study of nutritional qualities of defatted cotton seed and soybean meals. *Food Chemistry* 34(3); 1989; 203-213

Experiments were conducted on rats to investigate the quality of glandless cottonseed flour compared to soybean flour prepared in the same way. In order to inactivate toxic residual factors, an additional heat treatment (steaming at 112 C for 15 min) was applied on both flour samples. Cottonseed flour contained 39% protein and about 1.7% ether extract. Dietary fibers ranged from 19.2 to 20.6%. Antinutritional compounds were absent, except phytic acid (4.4%) which was still present after steaming. Nutritional parameters, used as criteria in this work, i.e., protein efficiency ratio (PER), biological value (BV) and net protein utilization (NPU), demonstrated a good intrinsic nutritional quality for cottonseed protein (unless it had a low lysine content), when compared with casein and soybean. Moreover, enzymic and light microscopic studies, which were performed on the digestive tract of animals, showed no noxious effect. AS

Groundnuts

- 1032 Chiou (RY-Y), Lin (CM) and Shyu (S-L). Property characterization of peanut kernels subjected to Gamma-irradiation and its effect on the outgrowth and aflatoxin production by *Aspergillus parasiticus*. *Journal of Food*

Science 55(1); 1990; 210-213, 217

Peanut kernels inoculated with *Aspergillus parasiticus* conidia and uninoculated kernels were gamma irradiated with 0 to 15 kGy using ^{60}Co . Levels of 2.5 and 5.0 kGy were effective in retarding the outgrowth of *A. parasiticus* and reducing the population of natural mold contaminants. However, elimination of these molds was not achieved. When irradiated with doses higher than 10 kGy, seed germinations were inhibited, changes in proteins were observed and oil stabilities decreased. After 4 wk incubation of the inoculated kernels in a humidified condition, aflatoxins produced by surviving *A. parasiticus* ranged from 69.12 to 13.48 $\mu\text{g/g}$ depending upon the original irradiation dose. AS

- 1033 Sylos (CM) and Rodriguea-amaya (DB). Inexpensive, rapid screening method for aflatoxins in peanuts and peanut products. *Journal of the Science of Food and Agriculture*. 49(2), 1989, 167-172

- 1034 Ihekoronye (AI) and Otadunjoye (MG). Formulation and physicochemical properties of high-protein food beverage powders based on protein concentrate from the Nigerian red skin groundnut (*Arachis hypogaea* L.). *Tropical Science* 28(4); 1988; 219-237

Four high-protein beverage products were formulated as dry powder systems based on Nigerian red skin groundnut protein concentrate (GPC). The basic ingredients were GPC 50.93%, 58.37%, 60.12%, with 25.47%, 14.59%, 12.02% and 6.40% of dried whole milk powder, resp. Sorghum malt powder, dried egg yolk powder, granulated sugar and vanilla were added, so that the ratio of each ingredient to GPC was 1:5, 1:12, 1:16 and 1:75 in the formulations. The products were milled to six different particle sizes, then reconstituted in water and their physicochemical properties studied. Compositional differences amongst samples did not have any significant effect. ($P < 0.05$) on the physicochemical properties; but differences in

particle size affected each product's relative viscosity, solubility, bulk density, water-absorption capacity and reconstitutability. Fractions having particle diameters between 300 and 425 μm , exhibited the least variable characteristics and performed better physicochemically as good beverages than similar compositional fractions of different particle size ranges. The powders were cream-coloured, slightly hygroscopic, highly soluble and reconstituted well in cold and hot water. Powder dispersion were moderately viscous and slightly acidic. The high protein content of the products is seen to be of special dietary importance as a means of alleviating protein and calorie malnutrition in Nigeria. AS

- 1035 Young (CY) and Hovis (AR). A method for the rapid analysis of headspace volatiles of raw and roasted peanuts. *Journal of Food Science* 55(1); 1990; 279-280

A rapid headspace analysis method for evaluating the flavour quality of peanut using gas chromatography has been developed and tested. Samples are ground, heated in glass vials for 30 min at 150 $^{\circ}\text{C}$, and the headspace injected using a gas tight syringe. After initial startup, one can screen samples for flavour defects at the rate of four per h. Of the peaks produced from peanut headspace analysis, most have been identified by gas chromatography/mass spectrometry and eight have been related to specific flavour characteristics. AS

Groundnut butter

- 1036 Crippen (KL), Hamann (DD) and Young (CT). Effects of grind size-sucrose concentration and salt concentration of peanut butter texture. *Journal of Texture Studies* 20(1); 1989; 29-41

A 3 X 3 X 3 factorial design with three grinds (fine medium and coarse), three salt concn. (0, 0.6 and 1.2%) and three sucrose concn. (0, 3 and 6%) was used in formulating peanut butters. Eleven sensory descriptive characteristics were examined, along with instrumental hardness, cohesion and power law flow model constants. A consumer panel rated the peanut butter texture using a 9-point hedonic scale. Increase in grind size decreased sensory smoothness, spreadability, adhesiveness and preference ratings, but increased instrumental cohesion and hardness, sensory adhesiveness and consumer texture ratings. Added salt increased the ease of swallowing, as well as consumer preference of texture. AS

Rapeseeds

- 1037 Dabrowski (KJ), Rutkowski (A), Manimanna (SG), Rowicka (A). The reduction of glucosinolate and sinapine contents under industrial processing of rapeseeds. *FAT Science Technology* 91(9); 1989; 361-363

The glucosinolate and sinapine contents in industrially processed samples including seed, conditioned flakes, expeller press cake, solvent extracted meal and toasted meal of high glucosinolate (HG) and double low (DL) rapeseed were determined. Technological unit processes including flaking, conditioning, expeller pressing and solvent extraction had a little effect on the content of glucosinolate (with exception of DL when one-fifth of glucosinolate was lost) and sinapine contents while toasting stage reduced contents of both compounds by 62 to 74% of original level in the seeds. Overall industrial process reduced glucosinolate content by 64 to 79% of seed value in HG and DL rapeseed, resp. whereas sinapine was decreased by 26% in both types of rapeseed. AS

Soybeans

- 1038 Ibrahim (N), Puri (RK), Kapila (S) and Unklesbay (N). Plant sterols in soybean hulls. *Journal of Food Science* 55(1); 1990; 271-272

Using gas chromatography techniques after lipid extraction, soybean hulls were analyzed for their plant sterol components. Soybean hulls contained 7.46% and 2.02% moisture and lipid components, resp. Three plant sterols, campesterol, stigmasterol, and Beta-sitosterol, were quantified in the ratios of 1:1.5:2. The use of soybean hulls as food ingredients was discussed for their potential serum cholesterol reducing effects. AS

- 1039 Ogunsanwo (BM), Faboya (OO), Ikotun (T) and Idowu (R). Fate of aflatoxins in soybeans during the preparation of soyogi. *Die Nahrung* 33(5); 1989; 485-487

"Soyogi" is the patent name given to a fermented soybean flour produced by the Federal Institute for Industrial Research, Lagos, Nigeria. Natural occurrence of aflatoxin in soybeans have been reported. However, little information is available on the loss of aflatoxin from contaminated seeds as a result of food processing. The objective of this study is to investigate the effect of autoclaving and fermentation on the

aflatoxin content in contaminated soybeans, all the more since WEI et. al. had earlier reported the presence of aflatoxin in fermented soybean paste. AS

Soy products

Soy flour

- 1040 Winters (DD), Cuppett (SL) and Zeece (MG). Comparison of purification procedures for beta-conglycinin and the effect of toasting. *Journal of Food Science* 55(1); 1990; 283-283

A comparison of the effectiveness of two procedures, ammonium sulphate fractionation and concanavalin A affinity (Con A) chromatography, for the purification of beta-conglycinin from soy flour was made. In addition, the effect of toasting on the effectiveness of these two procedures for purifying beta-conglycinin was studied. Results indicated that Con A affinity chromatography was less effective than the ammonium sulphate fractionation for the purification of beta-conglycinin. The ammonium sulphate fractionation produced nearly homogeneous beta-conglycinin; however, the yield from this procedure was very low (4.1%). Toasting the soy flour decreased the purification effectiveness of both procedures. AS

Soy milk

- 1041 Obata (A), Matsuura (M) and Fukushima (D). Spectrophotometric determination of sulphahydryl groups in soy milk using 2,2-dithiobis-(5-nitropyridine). *Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)* 36(9); 1989; 707-711 (Ja).

The measurement of sulphhydryl (SH) groups in soy milk is very important, because they are closely related to the firmness of tofu-gel. However, soy milk is not transparent and therefore the determination of its SH groups by spectrophotometric method is quite difficult. The present paper deals with the spectrophotometric method, by which the SH groups in soy milk can be determined directly and easily, using 2,2'-dithiobis-(5-nitropyridine) (DTNP). First, the effect of perchloric acid (deproteinizing agent) on-5-nitro-2-thiopyridine (NTP), the reaction products between DTNP and SH groups, was investigated. As a result, NTP was stable in 5% perchloric acid and its peak of the absorption shifted from 386 nm to 376 nm accompanying with the increase of the absorption

intensity. On the basis of these facts, a new method to determine the SH groups in a turbid solution, such as soy milk has been developed. Using this method the changes of the SH groups in soy milk during a heating were examined. The result showed that the SH content in soy milk increased during the first 2 or 3 min by the heating at 100 C. AS

Tofu

- 1042 Van der Riet (WB), Wight (AW), Cilliers (JJL) and Dattel (JM). Food chemical investigation of tofu and its by-product okara. *Food Chemistry* 34(3); 1989; 193-202

Tofu, an oriental soy food now produced commercially in countries outside of its traditional home, was prepared from soybeans of the cvs Edgar, Hutton and Prima. The products, which is cheese-like in character and in method of preparation, was produced according to a modified method which included the addition of a coagulant mixture consisting of CaCl dihydrate and calcium sulphate dihydrate at levels which not only resulted in good tofu, yields, but also elevated the Ca levels in such a manner as to make the product comparable to cheese as regards the wet wt. concn. of this essential dietary mineral. Tofu, together with its fibrous by-product, okara, and also the soybeans used in their manufacture, were subjected to food chemical analysis, namely the proximate as well as mineral and B group vitamin (thiamin, riboflavin and nicotinic acid) contents; in addition, specific analyses were performed to determine the contents of insoluble as well as soluble fibre, phytic acid, monosaccharides, oligosaccharides and starch. Average energy values were calculated from the data for protein, oil and total carbohydrates. AS

Soy proteins

- 1043 Fiora (FA), Pilosof (AMR) and Bartholomai (GB). Physicochemical properties of soybean proteins related to flow, viscoelastic, mechanical and water-holding characteristics of gels. *Journal of Food Science* 55(1); 1990; 133-136

Initial viscosity, the thixotropic relaxation time, hardness, fracturability and water-holding capacity showed a positive correlation with the water absorption capacity of commercial soy protein isolates. However, cohesiveness was negatively affected. Springiness and the degree of elasticity were correlated to the oil absorption capacity, indicating that the degree of elasticity would be enhanced by an increase in

the hydrophobic character of the protein. Initial viscosity of gels was highly correlated to the fracturability and cohesiveness to water-holding properties. The degree of elasticity correlated to flow parameters. AS

- 1044 Khan (A), Weaver (CM) and Sathe (S). Association of zinc with soy proteins as affected by heat and pH. *Journal of Food Science* 55(1); 1990; 263-264, 266

The effect of heat on the chemical association of ^{65}Zn with proteins and of pH on the solubility of proteins, phytic acid, Zn, and their complex formation were studied in soybeans grown hydroponically and intrinsically labeled with ^{65}Zn . ^{65}Zn association with soy proteins was not affected by autoclaving. Zn was not covalently associated with the major soy proteins, 11S and 7S. Protein, phytic acid and zinc content of the raw soy flour was determined at pH range 3.5-12 before and after dialysis. pH had only a slight effect on Zn solubility. Protein-zinc-phytate complex formation was max. in the pH range 7.5-10.5. AS

- 1045 Shih (FF). Deamidation during treatment of soy protein with protease. *Journal of Food Science* 55(1); 1990; 127-129, 132

When soy protein was treated with protease in phosphate buffer, ammonia was generated in addition to the occurrence of peptide bond hydrolysis. The source of the ammonia was likely the non-enzymatic deamidation of glutamine in the hydrolysate because free glutamine was found to deaminate in phosphate buffer with or without protease. Both the glutamine deamidation and the deamidation during enzymatic proteolysis of soy protein were catalyzed by certain anions. Of the anions investigated, phosphate and bicarbonate were by far the most effective in the regard, borate only slightly effective, and acetate not effective at all. AS

- 1046 Tanteerataarm (K), Wei (LS), Steinberg (MP) and Yamashita (N). Bound water associated with 7S and 11S soy proteins determined by vapour sorption isotherms and pulsed NMR. *Journal of Food Science* 55(1); 1990; 130-132

Bound water associated with freeze-dried 7S and 11S proteins was characterized by applying both sorption isotherm and proton pulsed NMR techniques. Over the water activity range 0.10 to 0.97, the water binding capacity of the 7S protein was superior to that of the 11S protein. There was no significant difference in sorption capacity between unheated

and heated proteins. The isotherms showed a biphasic linear relation so that two states of bound water, namely polymer and capillary water, were distinguished. NMR data followed isotherm data. The NMR mobility of the polymer water was less than that of the capillary water, as expected. However, high mobility was not related to high moisture content in the capillary water region. AS

Sunflower seeds

- 1047 Etcheverry (M), Dalcero (A), Chulze (S), Apro (N), Fusero (S) and Farnochi (M). Studies on damages to sunflower seeds. Water activity, germination acidity index and aflatoxin B1 presence. *International Journal of Food Microbiology* 8(4); 1989; 363-365

The significance of fungal contamination during the storage of sunflower seeds has been investigated. Samples were taken during 7 months at 45 day-intervals. Water activity, seed germination, presence of aflatoxin B1 and free fatty acids were monitored. It was demonstrated that water activity increased during storage, germinability decreased, the content of free fatty acid increased and so did the content of aflatoxin B1. AS

TUBERS AND VEGETABLES

Onions

- 1048 Sass-Kiss (A), Petro-Turza (M), Szarfoldi-Szalma (I), Pino (J) and Rosado (A). Investigation on the volatile oil of Mako onions. *Die Nahrung* 33(5); 1989; 413-321

The authors have developed a method for determining the volatile oil content of onions. Using this method they found in the Hungarian Mako' onions 0.019-0.031% volatile oil, depending on storage. The comp. of onion oil was studied by GC; GC-MS and TLC methods. GC-MS revealed 20 volatile sulphur compounds identified as 10 trisulphides, 6 disulphide, 3 tetrasulphides, and 1 thiophene derivative as well as one unsaturated aldehyde. Three of these; ethyl cis-1-propenyl trisulphide, ethyl trans-1-propenyl trisulphide, and butyl methyl trisulphide were described for the first time in onions. Carbonyl compounds were studied in the form of derivatives obtained with 2,4-dinitrophenyl hydrazine. On the basis of Rf-

values and by addition, propanal, butanal, pentanal and hexanal were identified in the aldehyde fraction, while in the dicarbonyl fraction-beside an unknown compound-glyoxal and methyl glyoxal were identified. The presence of these two compounds in onion oil has been reported for the first time. AS

Carrots

- 1049 Chang (SY) and Toledo (RT). Simultaneous determination of thermal diffusivity and heat transfer coefficient during sterilization on carrot dices in a packed bed. *Journal of Food Science* 55(1); 1990; 199-205

Carrot dices were heated under ultra-high temp. sterilization conditions in a packed bed to quantify the effect of superficial fluid velocities on heat transfer coeff. (h) and obtain a value for thermal diffusivity (α) h and α were determined simultaneously under non-constant heating fluid temp. using a finite differences technique. Temp. profiles calculated using assumed h and α were matched with measured temp. at two points in a cube. Using best fit values for α of $1.94 \times 10^{-7} \text{ m}^2 \text{ sec}$, mean h ranged from 600 to 1533 and 359 to 735 $\text{W/m}^2 \text{ K}$ for 0 and 1.58 cm/sec fluid velocity and 1 and 2 cm cubes, resp. At 15.2 cm/sec, when α controlled heat transfer, calculated α was $1.86 \pm 0.044 \times 10^{-7} \text{ m}^2 \text{ sec}$. AS

- 1050 Reeleder (RD), Raghavan (GSV), Monette (S) and Gariepy (Y). Use of modified atmospheres to control storage rot of carrot caused by *Sclerotinia sclerotiorum*. *International Journal of Refrigeration* 12(3); 1989; 159-163

The potential of silicone membranes to provide modified atm. for control of storage rot of carrot caused by *Sclerotinia sclerotiorum* (Libi) de Bary and maintain carrot quality was assessed. Modified atm. reduced damage to carrots caused by *S. sclerotiorum* and maintained carrot quality at a high level when compared to standard high humidity refrigerated storage. Silicone membranes with a surface area of 21.24 cm^2 ($7/80 \text{ cm}^2 / \text{kg}^{-1}$ carrots) provided an atm. of 3.03% carbon dioxide and 4.57% oxygen in the absence of inoculum of *S. sclerotiorum* (treatment C1). This atm. resulted in carrots with significantly better flavour and appearance than other atm. tested. Work measurements indicated that treatment C1 carrots required less force in cutting than high humidity atm. carrots. When inoculum of *S. sclerotiorum* was added to

carrots held in containers with 21.24 cm² silicone membranes, carbon dioxide levels continued to increase during the six months of the experimental period. Disease control was significantly better than in standard high humidity storage with losses reduced by 40%. AS

Horseradish

- 1051 Paakkonen (K) and Roos (YH). Effects of drying conditions on water sorption and phase transitions of freeze-dried horseradish roots. *Journal of Food Science* 55(1); 1990; 206-209

The water sorption isotherms for freeze-dried horseradish roots (*Armoracia rusticana*) were determined using the interval sorption technique, and the thermal behaviour of dried and rehumidified products was analyzed using differential scanning calorimetry. The hygroscopicity of the dried material increased when the surface temp. during freeze-drying was increased from 20 C to 60 C. Both sorption and thermal data showed that drying at high surface temp. affected the physical structure of the material, resulting in increased water absorption, decreased glass transition temp. and increased unfreezeable water content. Water sorption isotherms and thermal data can be used to determine the proper drying and storage conditions for horseradish roots. AS

Potatoes

Potato chips

- 1052 Leszkowiat (MJ), Barichello (V), Yada (RY), Coffin (RH), Loughheed (EC) and Stanley (DW). Contribution of sucrose to non-enzymatic browning in potato chips. *Journal of Food Science* 55(1); 1990; 282-282, 284

The contribution of sucrose, a nonreducing sugar, to non-enzymatic browning in potato chips was investigated using a model system of buffered sugars and glycine applied to filter paper discs that were then heated in oil. It was found by fiber optic colorimetry that sucrose and the amino acid produced darkening comparable to that of reducing sugars. It is postulated that sucrose enters the reaction by thermal hydrolysis to yield glucose and fructose. Addition of glucose and glycine to potato slices by vacuum infiltration resulted in increased darkening after frying but the sugar proved to be the limiting factor in non-enzymatic browning of potato chips,

emphasizing the importance of sucrose in this reaction. AS

Sweet potatoes

Sweet potato starch

- 1053 Boki (K), Ohno (S) and Shinoda (S). Moisture sorption characteristics of kudzu starch and sweet potato starch. *Journal of Food Science* 55(1); 1990; 232-235

Moisture sorption characteristics of kudzu starch and a sweet potato starch were investigated based on the results of moisture sorption isotherms at 11, 20, and 30 C, thermal analysis, isosteric heat of sorption and entropy of sorption. The water of crystallization in sweet potato starch was strongly retained compared with that in kudzu starch. Differences in amount of moisture sorbed between kudzu starch and sweet potato starch seemed to be attributable to the stability of the microscopic structure. The interaction of moisture-sweet potato starch was stronger than that of moisture-kudzu starch. Amount of moisture sorbed and strength of moisture-starch binding of the starches, preheated to 110 C decreased compared with those of the starches vacuum-dried at 20 C because of release of water from the amorphous part of the starch granule. AS

Yams

- 1054 Mozie (O). Effect of storage temperature on storage weight losses in white yam (*Dioscorea rotundata* Poir.) tubers. *Tropical Science* 28(4); 1988; 273-275

Three yrs of storage trials involving white yam (*Dioscorea rotundata* Poir) tubers stored under controlled temp. (10, 16, 30 C) showed that storage at 16 C resulted in less wt. losses than storage at 10 C and 30 C. Unwashed white yam tubers stored at 16 C had less storage wt. losses during a long storage period of 9 months than tubers from the same source stored at 10 C or 30 C. Tubers stored at 16 C remained firm, turgid, non-sprouting and rot-free throughout the long storage period. Tubers stored at 10 C experienced chilling injury characterized by watery rot and deterioration early in storage accompanied with significant losses in wt. those tubers stored at 30 C showed high incidence of sprouting and significant losses in wt. AS

Vegetables

- 1055 Albrecht (JA), Schafer (HW) and Zottola (EA). Relationship of total sulphur to initial and retained ascorbic acid in selected cruciferous and non-cruciferous vegetables. *Journal of Food Science* 55(1); 1990; 181-183

Selected cruciferous (including six cvs of broccoli) and non-cruciferous vegetables were analyzed for ascorbic acid, total sulphur, moisture contents and pH. Vegetables were assayed initially after harvest and after three wks storage at 2 °C and 95-100% relative humidity. During storage ascorbic acid retention in cruciferous vegetables ranged from 75-98%, whereas non-cruciferous vegetables ranged from 16-75% retention. Initial ascorbic acid content correlated and non-cruciferous vegetables. A correlation coeff. of 0.230 was obtained for the initial ascorbic acid content versus total sulphur content within six broccoli cvs. AS

- 1056 Hemeda (HM) and Klein (BP). Effects of naturally occurring antioxidants on peroxidase activity of vegetables extracts. *Journal of Food Science* 55(1); 1989; 184-185, 192

The effectiveness of alpha-tocopherol, two flavonoids (quercetin and rutinic acid) and a cinnamic acid (chlorogenic acid) as inhibitors of peroxidase was evaluated. Four concn., 125, 250, 500 and 1000 mg%, each of compound were used. Crude extracts of tomatoes, carrots and eggplant were the sources of enzyme activity. Peroxidase activity of carrots and eggplant was inhibited more than that of tomato by all antioxidants. Alpha-tocopherol was least effective in all systems and at all concn. Chlorogenic acid was most effective, followed by quercetin and rutinic acid. AS

Cucumbers

- 1057 Schieberle (P), Ofner (S) and Grosh (W). Evaluation of potent odourants in cucumbers (*Cucumis sativus*) and muskmelons (*Cucumis melo*) by aroma extract dilution analysis. *Journal of Food Science* 55(1); 1990; 193-195

The volatile components of cucumbers and muskmelons were analyzed by a technique which reveals the odourants having the highest odour units (ratio of the concn. to the odour threshold). (E/Z)-2,6-Nonadienal, followed by (Z)-2-nonenal and (E)-2-nonenal were the most significant odourants of cucumbers. The flavour of muskmelons was more complex.

Methyl-2-methylbutanoate, (Z)-3-hexenal, (E)-2-hexenal, and ethyl-2-methylpropanoate were identified as the primary odourants. AS

Tomatoes

- 1058 Petro-Turza (M) and Teleky-Vamosy (Gy). Study on taste substances of tomato. Part 2. Sensory evaluation. *Die Nahrung* 33(5); 1989; 387-394

The role played by amino acids and minerals in the formation of the taste of tomatoes by means of sensory evaluation of model solutions is discussed. In preparing the model solutions the results of the thorough analysis of two tomato cvs (K-549 and Mokka) were taken into account. It was established that the effect of free amino acids on the pH and the buffer capacity of the system cannot be neglected, in addition in the presence of minerals they affect taste advantageously, contribution to the development of tomato character. The effect of pyrrolidone-carboxylic acid (PCA) on the taste was also investigated. The sensory threshold value of PCA in aqueous solution was found to be 500 p.p.m. The quality of taste was found sour, tart and occasionally bitter. On addition PCA to tomato puree the appearance of off-flavour was not observed, indeed it was found that in certain concn. it affected the taste of lower quality purees advantageously. AS

FRUITS

Apples

- 1059 Qiu (C-G) and Rao (MA). Effect of dispersed phase on the slip coefficient of apple sauce in a concentric cylinder viscometer. *Journal of Texture Studies* 20(1); 1989; 57-70

Slip coeff. for apple sauce in concentric cylinder viscometer were determined using concentric cylinders of different radii according to the theory of Mooney. Wall slip was relatively low for highly shear-thinning samples and for highly viscous samples; it also decreased with increase in pulp content until tunneling of the sample by the bob condition was

reached. Wall slip coeff. varied with the applied torque so that any comparison of slip between samples must be made by determining the slip coeff. for the samples at the same magnitude of applied torque. AS

Apricots

- 1060 Toth-Markus (M), Boross (F), Blazso (M) and Kerek (M). Volatile flavour substances in different apricot cultivars. *Die Nahrung* 33(5); 1989; 433-442

As a part of a secretion study, the aroma of the most common Hungarian and several foreign cvs was investigated. Four cvs were studied during three consecutive yrs. three other only once. The cvs contained the same main components in different ratios. The quantity of 30 components identified earlier was measured. Statistical evaluation of the results is also given. Sensory descriptive analysis coupled with gas chromatographic separation of aroma extracts was performed, the odour values of individual components were calculated. AS

- 1061 Toth-Markus (M), Boross (F), Blazso (M) and Kerek (M). Volatile flavour substance of apricot and their changes during ripening. *Die Nahrung* 33(5); 1989; 423-432

Aroma content and comp. of different Hungarian and foreign apricot cvs were studied. Volatile flavour substances were isolated by simultaneous steam distillation-extraction. GC and GC/MS analysis of the aroma extracts revealed 40 components, 12 of them have been reported for the first time in apricots. The changes in the aroma comp. of the cvs "Hungarian kajszai" during ripening were also studied. AS

Apricot jams

- 1062 Villarroel (M) and Costell (E). Influence of temperature and composition on the rheological behaviour of apricot jam. *Revista de Agroquímica Y Tecnología de Alimentos* 29(1); 1989; 90-98

Rheological behaviour of apricot jams of different comp. (60.8 less than or equal to Brix less than or equal to 67.3; 30.0 < % fruit < 53.5) were studied at several temp. (25, 35, 45, 55 and 65 °C). Flow of ground jams was plastic at all temp. and fitted to the Herschel and Bulkley model ($\tau = \tau_0 + K D^n$). Interaction between temp. and sample comp. showed a significant effect on the values of τ_0 , K and E_{app} at 100 s⁻¹

(P less than or equal to 0.01) but not on n values. Variations of K and Eta values with temp. followed Arrhenius relationship (r greater than or equal to 0.990 and r greater than or equal to 0.981) closer than those of Tau (r less than or equal to 0.920). Activation energy values (Ea) were similar for the three rheological parameters (4.76 less than or equal to Ea less than or equal to 6.01 Kcal/mol) and in general, tended to decrease when fruit content increased. AS

Citrus fruits

- 1063 Diaz Borrás (MA) and Vila Aguilar (R). Evolution of fungi flora present in Spanish citrus packin-houses in degreening time. II. Study on fruits surface. *Revista de Agroquímica Y Tecnología de Alimentos* 29(1); 1989; 85-89 (Es).

A study of fungal contamination on the surface of Clementina mandarines in five citrus degreening rooms was carried out. The results showed the predominant presence of *Cladosporium herbarum* on mandarines surface. Fungal contamination was greater on the processed fruits at the end of the degreening period. AS

Loquat fruits

- 1064 Frohlich (O) and Schreier (P). Volatile constituents of loquat (*Eriobotrya japonica* Lindl.) fruit. *Journal of Food Science* 55(1); 1990; 176-180

Concentrates of fresh ripe Spanish loquat fruit were analyzed by HRGC, HRGC-MS and HRGC-FTIR. In total, 80 aroma substances were identified, of which 72 are reported for the first time as loquat fruit constituents. The major part of volatiles comprised alcohols and carbonyls. Quantitative HRGC revealed hexanal (24 mg/kg fruit pulp), (E)-2-hexenal (1.8 mg/kg) and benzaldehyde (0.7 mg/kg) as major aroma compounds. AS

Oranges

- 1065 Gogorcena (Y) and Ortiz (JM). Characterisation of sour orange (*Citrus aurantium*) cultivars. *Journal of the Science of Food and Agriculture* 48(3); 1989; 275-284

Twenty-one cvs of sour orange (*Citrus aurantium* L) and relatives selected in different areas of Spain were studied. Morphological detn. were carried out both in leaves and in

fruits, including leaf size and area, number of oil glands, petiole length, fruit wt., number of seed and others. Biochemical analysis included electrophoretic separations of proteins from leaves and fruit rind as well as peroxidases and esterases from some of the organs. Also chromatographic separations of rind oils were carried out in mature fruits. Quantitative and qualitative differences were detected for some of the cvs. Enzyme differences were found to be adequate for distinction at the specific level. Two of the cvs, 'Bergamot' and 'Amargo clementino' segregate from the main group, which indicates their belonging to a different sp. or to a hybrid. The validity of the present detn. for distinction and characterisation of material to be included in a citrus germplasm bank is discussed. AS

Pears

- 1066 Cheh (PM), Varga (DM), Mielke (EA), Facticeau (TJ) and Drake (SR). Control of superficial scald on 'd'Anjou' pears by ethoxyquin. Oxidation of alpha-farnesene and its inhibition. *Journal of Food Science* 55(1); 1990; 171-175, 180

Alpha-farnesene in the skin tissue of 'd'Anjou' pears (*Pyrus communis*, L.) increased to a max. after 3 months of storage in air at -1 C and then declined. Alpha-Farnesene was oxidized to conjugated trienes and its oxidation was inhibited by ethoxyquin. The split applications by drenching fruit with 1000 p.p.m. ethoxyquin at harvest and then line spraying 1700 p.p.m. after 1, 2 or 3 months of storage inhibited the oxidative activity of alpha-farnesene similar to the single application with 2700 p.p.m. ethoxyquin by drenching fruit at harvest. Incidence of superficial scald was highly correlated with the level of conjugated trienes. The control of scald by ethoxyquin was due to its antioxidant action and/or its inhibition of conjugated trienes biosynthesis. AS

- 1067 Chen (PM), Varga (DM), Mielke (EA), Facticeau (TJ) and Drake (SR). Control of superficial scald on 'd' Anjou' pears by ethoxyquin. Effect of ethoxyquin concentration, time and method of application, and a combined effect with controlled atmosphere storage. *Journal of Food Science* 55(1); 1990; 167-170

'd'Anjou' pears (*Pyrus communis* L.) without ethoxyquin developed superficial scald upon ripening after 3 months of storage. Ethoxyquin at 1,000 p.p.m. controlled scald for 4 months and did not cause phytotoxicity to the fruit.

Ethoxyquin at 2,700 p.p.m. controlled scald for 5 months but caused phytotoxicity to the fruit. Fruit drenched with 1000 p.p.m. ethoxyquin with in 2 days after harvest plus an additional line spray of 1,700 p.p.m. ethoxyquin after 1 to 3 months of storage developed minimal scald incidence and did not suffer phytotoxicity after 5 months. Pre-storage drench of ethoxyquin at 500 p.p.m. to 'd'Anjou' fruit was sufficient to control the scald disorder for up to 7 months in a controlled atm. (2% oxygen + 1% carbon dioxide) storage. AS

Strawberries

- 1068 Guemes (DR), Pirovani (ME) and di Pentima (JH). Heat transfer characteristics during air precooling of strawberries. *International Journal of Refrigeration* 12(3); 1989; 169-173

Heat transfer characteristics during air precooling of strawberries were studied. Effective surface heat transfer coef. were detn. and a Nu-Re correlation which includes the effect of moisture evaporation was developed. The mean value of film coeff. obtained for strawberries were 16 to 25% higher than those predicted by the correlation of McAdams for spheres cooled only by convection. Furthermore, a geometry analysis for strawberries was carried out when determining surface heat transfer coeff. It was concluded that for practical applications strawberries may be acceptably considered as spheres, since correction for anomalous shape does not cause significant differences. AS

CONFECTIONERY, STARCH AND SUGAR

Confectionery

- 1069 Jackson (EB). Glucose syrups, a blue print for improved confectionery. *Confectionery Production* 55(11); 1989; 745

The properties of various glucose syrups, their application and ratio of glucose syrup to sugar under different cooking methods are briefly described. SYR

- 1070 Talbot (G). Fat migration in confectionery products. *Confectionery Production* 55(10); 1989; 655-656

The reasons for fat migration in chocolate enrobed, and its prevention are briefly described. Three solutions have been

described to minimise or prevent fat migration - filling fats which are compatible with a var. of different coatings, barrier fats and structuring fats. SYR

- 1071 Wyatt (JS). The regulatory status and use of alternative emulsifiers in the confectionery industry. **Manufacturing Confectioner** 69(9); 1989; 120-122

The various types of new emulsifiers and their functionality in chocolate and confectionery are briefly described. The FDA regulation for emulsifiers in USA are also mentioned. SYR

Candies

- 1072 Klacik (KJ). Continuous production of sugar free hard candies. **Manufacturing Confectioner** 69(8); 1989; 61-67

The important parameters to produce sugar-free hard candy are discussed. These include successful implementation of the quick set method using sorbitol/mannitol, low moisture content during depositing and control of post-crystallization or graining by choosing proper packaging materials. SYR

Chocolates

- 1073 Jacobson (FB). Food labeling, with special reference to candy and chocolate. **Manufacturing Confectioner** 69(8); 1989; 33-36

The article briefly reviews the labelling requirements important to the confectionery industry. SYR

- 1074 Jeffery (MS). The technology of chocolate, biscuit confections and granola bars. **Manufacturing Confectioner** 66(9); 1989; 125-131

The article reviews the technology, raw materials used, manufacturing operations and good manufacturing practices in the manufacture of baked biscuits, combinations of biscuits and confectionery, and granola bars. The range of baked biscuits includes rotary moulded, deposited, cut and wafers. Combinations of biscuits and confectionery includes caramel and biscuit with the combinations of baked biscuit and caramel and caramel wafers; and mallow and biscuit. Two types of granola bars, a baked biscuit type and one which is made by agglomeration of ingredients, both covered in chocolate or chocolate-like coating are discussed. SYR

- 1075 Lees (R). Recipe compilation, ERH and microbiological implications in sweet and chocolate manufacture. Part 2. **Confectionery Production** 55(7); 1989; 471, 473

The moisture content in various confectionery products and its influence on the storage behaviour of products are briefly described. SYR

- 1076 Lees (R). Recipe compilation, ERH and microbiological implications in the manufacture of sweets and chocolate. Part 4. **Confectionery Production** 55(9); 1989; 606, 611

The problems of mould growth on some confectionery products, the source of mould spores and their elimination are briefly discussed. The yeast and bacterial problems and their prevention are also described. SYR

- 1077 Riedel (HR). Chocolate making with a single multipurpose machine. **Confectionery Production** 55(10); 1989; 674-675

Chocolate making using a single multipurpose machine is briefly described. The machine combines a mixing action without much in the way of kneading arms, it grinds to the right degree of fineness and it conches very effectively. SYR

Cocoa

- 1078 Kirchhoff (PM), Biehl (B), Ziegeler-Berghausen (Hammor (M) and Lieberei (R). Kinetics of the formation of free amino acids in cocoa seeds during fermentation. **Food Chemistry** 34(3); 1989; 161-169

The predominance of leucine, phenylalanine, alanine and tyrosine among the free amino acids released from proteins during fermentation of cocoa seeds was further studied by following the kinetics of amino acids turnover during fermentation-like seed incubation and acetone dry-powder incubation by HPLC-analyses. Free acidic amino acids of the unfermented seeds disappear before onset of post-mortem proteolysis in a premortem phase of seed incubation. During subsequent post-mortem proteolysis in whole seeds (incubated at 50 °C in acetic acid/NaOH (200 mM; pH 4.5) leucine, phenylalanine, alanine and tyrosine are predominantly released. The initial high rate of amino acid formation decreases rapidly and their relative proportions change continually. With acetone dry-powder incubations, it is shown that a decreasing

nib pH affect the amino acid composition but does not explain these changes, especially not the strongly decreasing ratio of (ala + tyr):(leu + phe). Since vacuolar storage proteins are degraded earlier than other seed proteins, it is assumed that this change in substrate proteins is responsible. AS

- 1079 Schmid (H) and Chiappa (O). Cocoa roasting from the nibs to the liquor. *Confectionery Production* 55(11); 1989; 713-714, 716, 733

The pin mills for pregrinding raw, roasted or alkalised cocoa nibs and their advantages are briefly mentioned. The advantages of roasting cocoa liquor in PDAT system compared with roasting of nibs are also described in brief. SYR

Cocoa butter

- 1080 Davis (TR) and Dimick (PS). Isolation and thermal characterization of high-melting seed crystals formed during cocoa butter solidification. *Journal of the American Oil Chemist's Society* 66(10); 1989; 1488-1493

Seed crystals which formed during early stages of cocoa butter solidification have been isolated and determined to have extremely high melting points. The melting points of the seed crystals generally exceeded 60 C in contrast to cocoa butter, which melts between 30-35 C. In addition, the melting point of the seed crystals decreased as a function of crystal growth time. Evidence suggests that the high-melting seed crystal is not an additional polymorphic form of cocoa butter, but rather a distinct crystalline entity. Consequently, a unique compositional make-up is suspected as being responsible for the elevated melting point. A technique to separate seed crystals from the molten cocoa butter mass has been developed. The procedure has been shown not to alter the thermal and compositional properties of the isolated seed crystals. AS

- 1081 Davis (TR) and Dimick (PS). Lipid composition of high-melting seed crystals formed during cocoa butter solidification. *Journal of the American Oil Chemist's Society* 66(10); 1989; 1494-1497

High-melting seed crystals which form during the early stages of cocoa butter solidification possess a lipid composition different than the cocoa butter from which the seed crystals were grown. Significantly large quantities of glycolipids, 11.1%, and phospholipids, 6.6-8.1%, were found in the high-

melting seed crystals along with a dramatic decrease in the simple lipid class. The fatty acids comprising the simple lipid fraction of the seed crystals were considerably more saturated than the fatty acids present in the same fraction of the original cocoa butter. The increase in the degree of saturation was reflected in the triacylglycerol comp. Cocoa butter samples were predominantly monounsaturated triacylglycerols while the seed crystal samples were mainly trisaturated triacylglycerols. The elevated melting point (60-70 °C) of the seed crystals was due to the presence of higher melting complex lipids as well as to the increase in saturated triacylglycerol sp. As a result of the evidence provided, the high-melting seed crystal is indeed a distinct crystalline entity and not an additional polymorphic form of cocoa butter. AS

Honeys

- 1082 Serra Bonvehi (J). Validity of indices for predicting honey crystallization. *Revista de Agroquímica Y Tecnología de Alimentos* 29(1); 1989; 47-62 (Es).

Triuplicated thirty three samples of Spanish and foreign monofloral and multifloral honeys were stored for one yr at room temp. (mean temp. of 15 and 20.8 °C average max. temp.). Samples had been previously selected by melissopalynological, physical and chemical analyses in order to cover the widest range of crystallization on the white scale, during the storage recrystallization process. All samples were collected out of pasteurized lots (75-80 °C during 8 to 10 min), verifying, by means of a polariscope the lack of glucose crystals as primary crystallization nuclei, in order to be able to apply the indices which better predict honey crystallization: glucose/water, fructose/glucose, glucose-water/fructose, oversaturation coeff. at 20 °C, water activity and Tabouret indices as well as to observed the inhibitory influence that honey viscosity may effect on recrystallization itself. AS

Starch

- 1083 Cecil (JE). Dewatering starch in small factories. *Tropical Science* 28(4); 1988; 263-272

This paper assess a noval system which has simple vaccum filter with no moving parts. For very small scale operations of vaccum may be produced very inexpensively by means of a reversed bicycle pump. For larger scale opeations a motar

driven vacuum pump may be preferred. By dewatering overnight, moisture level of the starch is reduced sufficiently to render it microbiologically much more stable. Dewatering can substantially reduce drying costs, it also raises possibilities of interesting procedures and techniques. SRA

- 1084 Chinachoti (P). Isotherm equations for starch, sucrose and salt for calculation of high system water activities. *Journal of Food Science* 55(1); 1990; 265-266

The mass balance equations previously developed for formulated foods were extended to the starch-sucrose-salt system at high water activity. For starch, the Smith isotherm was extrapolated; sucrose and salt data were divided into two water activity regions below and above 0.925 with the second region extrapolated on the Smith isotherm to 0.9998 water activity. Isotherm parameters and water activity calculated for representative mixtures were determined. Comparison of the calculated values with those measured by the isopiestic method showed a correlation coefficient of 0.968. AS

- 1085 Hari (PK) and Sarita Garg. Evaluation of properties of starch and modified starch for sizing and desizing. *Starch/Stärke* 41(3); 1989; 101-105

Viscosity, gelatinization characteristics, storage stability, gelling tendency and thermal reversibility of cooked starch and modified starch paste were studied. Solution rate of starch and modified starch films in water, hydrochloric acid and enzyme was evaluated. Hydroxyethyl starch showed lower gelatinization temp., low viscosity, increased storage stability to temp., time and thermal reversibility. The reheating of cooked paste deteriorates the properties of starch paste but the adhesive properties of hydroxyethyl starch were not affected. The introduction of hydroxyethyl group into starch significantly improved the dissolution ability of the films. AS

- 1086 Jenkins (D), Zahariadis (G) and Ayyobi (AF). Health implication of the processing of starchy foods. *Cereal Foods World* 34(10); 1989; 860-864

- 1087 Moorthy (SN) and Nair (SG). Studies of *Dioscorea rotundata* starch properties. *Starch/Stärke* 41(3); 1989; 81-83

Starch from six clonal selections of *Dioscorea rotundata* was isolated by standard procedure. The yield was between 20-

248. Various properties of these starches were compared. Granule size, 2% viscosity, peak viscosity, clarity, stability, total and soluble amylose contents were studied and only small variations were observed in the properties except paste viscosities among the clonal selections. The P content of *Dioscorea* starch was found to be three times as much as cassava starch, but low compared to potato starch. The high gel strength of *D. rotundata* starch paste compared to cassava gel may be attributed to the phosphate linkage among the starch molecules in the granules. AS

- 1066 Nishinari (KI), Cho (RK) and Iwanoto (MI). Near infra-red monitoring of enzymatic hydrolysis of starch. *Starch/Stärke* 41(3): 1989; 110-112

NIR measurement was carried out for a starch dispersal circulating from a reactor to an NIR flow-through cell over wavelength range of from 1000 to 2500 nm in 2 nm, increment. Multiple regression analysis between NIR and HPLC shows a good correlation. It is shown that the NIR method can be used to determine glucose quantitatively in real time during enzymatic hydrolysis, and that NIR may be employed for controlling the reaction in a bioreactor. AS

Sugar

- 1068 Lowius (JH). Explosion-proof pulverizer for the manufacture of sugar powder. *Lebensmittelindustrie* 36(4): 1989; 171-174 (Del).

BAKERY PRODUCTS

- 1090 Heino (MI), Oksilainen (VI), Linkola (EI), Varo (PI) and Kivistöinen (PI). Carotenoids and retinoids in Finnish food. Cereal and bakery products. *Cereal Chemistry* 66(4): 1989; 270-273

Bread

- 1091 Benedito De Barber (CI), Prieto (JA) and Collar (CI). Reverse phase high-performance liquid chromatography analysis changes in free amino acids during wheat bread dough fermentation. *Cereal Chemistry* 66(4): 1989; 263-268
- 1092 Czuchajowska (Z) and Poceranz (YI). Differential scanning

calorimetry, water activity, and moisture contents in crumb centre and near crust zones of bread during storage. *Cereal Chemistry* 66(4); 1989; 209-205

Water content, water activity, and enthalpy changes (by differential scanning calorimetry (DSC)) were determined in the center of the crumb and the near-crust area of polyethylene-wrapped bread stored for up to 168 h at 21 plus or minus 2 °C. Moisture content and water activity decreased little in the center of the crumb. In the near-crust area there was a large decrease in moisture content and in water activity during the first 24 h after baking. For thermograms of melting amylopectin crystallites, at about 50-60 °C, samples were tested by DSC after adding water to obtain a ratio of 1.5:1.0 of water to dry bread crumb. Mean temp. of onset and max. enthalpy changes were resp., 7.7 and 5.8 °C higher for the center crumb than for the near-crust zone. The peak area of amylopectin crystallite melting increased during 168 h of bread storage much more rapidly in the near crust than in the centre crumb. The difference reached a max. at about 48 h after baking. In the crumb center and near crust, resp. enthalpy changes were 0.27 and 0.66, 0.53 and 1.19 and 1.35 and 1.82 J/g after 24, 28 and 48 and 168 h. Without added water (as-is basis), the mean onset and max. peak temp. for dissociation of the amylose-lipid complex (110-140 °C) were, resp. 10.1 and 17.0 °C higher in the near crust than in the crumb center zones. Enthalpy values in the center averaged 0.52 J/g and changed little during storage; in the near-crust area, they averaged 1.04 J/g. When DSC thermograms were run with a 1.5:1.0 ratio of water to dry bread crumb, there were no significant differences in mean onset and max. peak temp. and enthalpy between crumb samples from the bread center and area near the crust zone. No consistent changes in enthalpy at 100-110 °C were recorded as a result of bread staling. AS

1093 Martínez-Anaya (MA), Pitarch (B), Bayarri (P) and Benedito de Barber (C). Microflora of the sour dough of wheat flour bread. VIII. Changes in sugar and organic acid production during fermentation of wheat doughs made with pure strains of microorganisms. *Revista de Agroquímica Y Tecnología de Alimentos* 29(1); 1989; 63-76 (Es).

Functional properties-gassing power, pH, and total titratable acidity-and sugars-glucose, fructose, sucrose and maltose-and organic acid-acetic and lactic - contents of wheat doughs made with microbial mass of individual fermentative microorganisms, isolated from wheat doughs, during

fermentation, have been studied. Yeasts- *Saccharomyces cerevisiae*, *S. fructuum* and *Candida boidinii*- and lactic acid bacteria *Lactobacillus plantarum*. *L. plantarum* var. *arabinosus*, *L. brevis*, *L. cellobiosus* and *Streptococcus faecium* have been inoculated. *S. cerevisiae* was the most active yeast, followed by *S. fructuum* and *C. boidinii*, their differences in gassing power were important but they also differed in the pH and total titratable acidity developed during fermentation. The metabolism of fermentable sugars varied for each yeast. Acetic (250-300 p.p.m.) and lactic acid (42-74 p.p.m.) production in 4 h was similar for all the yeasts. Lactic acid bacteria showed little differences in their functional properties -pH and total titratable acidity- after 4 h fermentation. At 24 h, *L. plantarum* and *L. brevis* gave the highest acidity to the doughs, and *Streptococcus faecium* the lowest. The levels of fermentable sugars along fermentation were dependent on the sp. The amount of acetic and lactic acids in doughs after 4 and 24 h were similar for all the bacteria. AS

Noodles

- 1094 Rho (KL), Chung (OK) and Seib (PA). Noodles VIII. The effect of wheat flour lipids, gluten, and several starches and surfactants on the quality of oriental dry noodles. *Cereal Chemistry* 66(4); 1989; 276-282

Removal of free lipids from hard wheat and soft wheat flours increased the whiteness and strength of the dry noodles; it increased cutting stress but decreased surface firmness of cooked noodles. In fractionation and reconstitution studies, non-polar lipids effectively restored surface firmness of cooked noodles, whereas non-polar lipids and glycolipids reduced breaking stress of dry noodles. Gluten from the hard wheat flour gave stronger noodles in dry and cooked form than did the soft wheat gluten, but both glutens were equally detrimental to surface firmness at levels above 7% in the flour. Addition of 10% modified wheat starch or waxy maize starch to the hard wheat flour increased the cutting stress and surface firmness of cooked noodles. At 0.5% level, lecithin increased the strength of the noodles, whereas sodium stearoyl-2-lactylate and monoglycerides improved surface firmness of cooked noodles. AS

Pies

- 1095 Zabik (ME) and Tipton (RC). Pie crust quality. Influence of use

fractionated and reconstituted soft wheat flour of varied protein content. *Cereal Chemistry* 66(4); 1989; 313-317

Four soft wheat cvs. of varied protein were used to evaluate the effect of protein on pastry quality. To further determine the effect of protein quality on pastry quality, these flours were fractionated into gluten and starch water solubles. The gluten was subsequently fractionated by pH to vary the glutenin-to-gliadin ratios. Flours were reconstituted to their original protein from whole crude gluten, single gluten fractions, and all gluten fractions in their original proportions. Fractionation patterns among flours from various wheat cvs differed significantly. Full restoration of original flour properties upon flour reconstitution was not achieved, indicating flour fractionation techniques adversely affected functionality. Among the flours of single pH fraction, flakiness, crust shrinkage, and surface blistering increased as pH of the flour fraction increased, whereas crust surface browning decreased. The flour cvs significantly affected pastry quality, with protein quantity of the wheat flour cvs being a determining factor. AS

MILK AND DAIRY PRODUCTS

- 1096 Dickinson (E), Mauffret (E), Rolfe (SE) and Woskett (CM). Adsorption at interfaces in dairy systems. *Journal of the Society of Dairy Technology* 42(1); 1989; 18-22

Factors affecting the comp. of fluid interfaces in dairy systems are assessed from a physicochemical viewpoint. Attention is directed towards recent development in understanding time-dependent and competitive aspects of the adsorption of milk proteins and small-mol. surfactants at oil-water and air-water interfaces. Experimental results are described for various casein and whey protein systems. The relationship between adsorption behaviours and the ease of formation and stabilization of dairy emulsions and foams is discussed with reference to model systems and commercial dairy products. AS

Milk

- 1097 El-Shafel (MM), Al-Amoudy (NS) and Said (AK). Effect of the drying process on the nutritive value of milk. Part 1. Biochemical composition. *Die Nahrung* 32(6); 1988; 553-557

Five different brands of instant dry whole milk that are most commonly used, and freeze-dried milk were analysed for N, fat, ash and 4 inorganic constituents and compared with human milks differed considerably. The protein content varied widely, ranging from 24.9 to 29.5%. Freeze dried and the highest fat content (42.6%). Three out of the five brands of dry milk studied were spray dried and the remaining two were roller dried. All milks tested contained considerably more Na, K, Ca and P solid than human milk, some of them the four fold amount of Ca and P. AS

- 1098 El-Shafei (MM), Al-Amoudy (NS) and Said (AK). Effect of the drying process on the nutritive value of milk. *Die Nahrung* 32(6); 1988; 559-564

Five different brands of dry milk and freeze-dried milk were used in rat feeding trials to study their nutritive value and to assess the effect of drying process on their nutritive value by using growth response, wt. gain, food efficiency and relative nutritive value (RNV). Brand I milk gave better growth response, wt. gain and food efficiency than any other dry milk studied, while brand V gave the least values. Freeze-dried milk gave better growth response, wt. gain and food efficiency than brand I milk. Using slope-ratio assay, freeze-dried milk gave the best RNV compared to all dry milks tested on the basis of the two response parameters used, wt. gain and moisture gain. AS

- 1099 Koops (J), Klomp (H) and Westerbeek (D). Determination of selenium in milk by spectrofluorometry and by zeeman-corrected, stabilized-temperature platform-furnace atomic absorption spectroscopy. Comparison of results. *Netherlands Milk and Dairy Journal* 43(2); 1989; 185-198

The present paper describes details of spectrofluorometric(SF) and atomic absorption method of Se in milk. The SF procedure utilises "one flask method" with perchloric acid digestion and with 2,3-diaminophthalene (DAN) as the reagent. The other method involves Se estimation in diluted samples with palladium and Mg as a matrix modifier. By both methods the values were same viz. winter milk -17 μ gSe/kg; summer milk -11 μ gSe/kg. The atomic absorption method was convenient and rapid but less precise than SF but both methods gave accurate results as observed from the data for Se. NGKR

- 1100 Lieske (B) and Konrad (G). A study on lactose hydrolysis. *Die Nahrung* 32(6); 1988; 585-593 (De).

Possibilities and limitations of the enzymatic and chem. lactose hydrolysis are shown and discussed in the light of own investigations with pure lactose solution, whey, UF-permeate, and skimmed milk. A refractometrically found lactose value obtained after separation of a lactose hydrolyzate on Molselect G 10 in a preparative gel filtration equipment serves for determining the degree of hydrolysis. In the same operation the removal of impurity salts is performed for clearing up sensory problems and the use-value of the lactose hydrolyzates. It reveals that the chemical lactose hydrolysis is only applicable for protein-free lactose media. Therefore and for cost reasons the chemical lactose hydrolysis is of no consequence to the dairy practice. The enzymatic lactose hydrolysis with P11-and temp. consistent lactose preparations in connection with the corresponding immobilization technique suggests the possibility of a useful utilization of whey and UF-permeate. AS

- 1101 Olano (A) and Calvo (MM). Kinetics of lactose, galactose and epilactose formation during heat-treatment of milk. *Food Chemistry* 34(4); 1989; 239-248

The kinetics of formation of lactose, galactose and epilactose during heating of milk were examined over a wide temp. time range (100-150 C/ 1-30 min). Formation of the studied carbohydrates was best described with apparent first order reactions. The Arrhenius plot of the rate constant as function of the reciprocal of the temp. (K) enabled calculation of the activation energies (125KJ/mol for lactose, 131 KJ/mol for epilactose and 139 KJ/mol for galactose). By using the kinetics parameters for calculating lines of equal degrees of formation in a plot of log-time versus reciprocal of absolute temp. It was possible to prepredict the effect of different heat-treatments on the formation of individual carbohydrates. AS

- 1102 Searle (AJF) and McAthey (P). Treatment of milk by gamma irradiation effect of anoxia on lipid peroxidation and the survival of *Pseudomonas aeruginosa*. *Journal of the Science of Food and Agriculture* 48(3); 1989; 361-367

One of the causes of organoleptic changes in milk, lipid peroxidation, has been monitored by a sensitive assay newly applied to foodstuffs. It has been shown that even at medium radiation doses (up to 3600 Gy) negligible lipid peroxidation

takes place, providing the milk is thoroughly gassed with N. Using a test spoilage microorganisms, *Pseudomonas aeruginosa* (Schroeter), it was shown that the D_{10} was 35 Gy in air and 105 Gy under anaerobic conditions. Dose/survival curves indicate that 5 decades of killing needed 200 Gy in air and 600 Gy under N. However, even after receiving a dose of 1600 Gy, both aerobically and anaerobically treated milk failed the methylene blue test at 21 days post-irradiation. The data indicate that, although the deleterious lipid peroxidation effects of irradiation can be minimised by the removal of air, this in turn results in a degree of protection being afforded to the bacteria, and that dose in excess of 1600 Gy are needed to effectively sterilise milk. AS

- 1103 van Boekel (MAJS), Nieuwenhuijse (JA) and Walstra (P). The heat coagulation of milk. 3. Comparison of theory and experiment. *Netherlands Milk and Dairy Journal* 43(2); 1989; 147-162

In this paper the numerous exp. concerning heat coagulation of unconcentrated milk described in the literature were tested against the model developed earlier as well as the new exp. have been described. It is seen that the effects of protein, salts, lactose, fat, and preheating could be explained with the model. The effect of urea could only be explained partly. It could be concluded that this model is able to explain the most striking features of heat coagulations of milk, which is not concentrated. NGKR

- 1104 van Boekel (MAJS), Nieuwenhuijse (JA) and Walstra (P). The heat coagulation of milk. Mechanisms. *Netherlands Milk and Dairy Journal* 43(2); 1989; 97-127
- 1105 van Boekel (MAJS), Nieuwenhuijse (JA) and Walstra (P). The heat coagulation of milk. 2. Kinetic studies. *Netherlands Milk and Dairy Journal* 43(2); 1989; 129-146
- 1106 Yau (NJN) and McDaniel (MR). Sensory evaluation of sweetened flavoured carbonated milk beverages. *Journal of Dairy Science* 72(2); 1989; 367-377

Carbonated and non-carbonated, sweetened blueberry flavoured milks were evaluated by a trained panel. The effect of carbonation and sweetener type (sucrose, high fructose corn syrup, aspartame, and pear conc.) on flavour properties was measured. Carbonation enhanced the sensory rating of overall flavour intensity, sweetness, and blueberry flavour. Sweetener type had a significant effect on the sensory rating

of viscosity but no effect on that of overall flavour intensity, sweetness, and blueberry flavour. A consumer-style panel evaluated carbonated beverages sweetened with the four different types of sweeteners. Approx. 50% of the panelists indicated that they liked the products. Carbonation and sweetness levels were near optimum; however, blueberry flavour level was judged to be too low. Sucrose and high fructose corn syrup were determined to be more acceptable sweeteners in the beverages than either aspartame or pear conc. AS

Milk products

Cheese

Blue cheese

- 1107 Alonso (L), Juarez (M) and Ramos (M). Contribution to the study of industrial blue cheeses. *Revista de Agroquímica Y Tecnología de Alimentos* 29(1); 1989; 77-84 (Es).

Changes undergone by the lipid and proteic fractions and hardness during three months of ripening of an industrial blue cheese have been studied. The sensory characteristics at the end of the ripening were also studied. Slight decrease of the soluble and insoluble volatile fatty acids indices and of the short chain fatty acids content were observed. Free fat acidity index as well as N fractions increased during ripening. The results were compared with those of artisanal blue cheese (Cabrales cheese). AS

Cheddar cheese

- 1108 Banks (JM), Brechany (EY) and Christie (WW). The production of low-fat Cheddar type cheese. *Journal of the Society of Dairy Technology* 42(1); 1989; 6-9

Cheddar cheese of 25% and 16% fat content was developed. Its processing standardised. Intermediate fat cheese had mild cheddar flavour, and better texture as compared to low-fat cheese. JSS

- 1109 Laleye (LC), Simard (RE), Lee (BH) and Holley (RA). Quality attributes of Cheddar cheese containing added lactobacilli. *Journal of Food Science* 55(1); 1990; 114-118

Various strains of homo- and heterofermentative lactobacilli isolated from Cheddar cheese were added to milk

with a commercial streptococci culture to produce Cheddar cheese. The heterofermentative lactobacilli *L. brevis* and *L. fermentum* almost always led to the development of fruity flavours, openness and late-gassing within 10 months of aging. Cheddar cheese produced using combined cultures of heterofermentative lactobacilli and *L. casei-casein* or *L. casei pseudopantarum* did not exhibit gas formation and openness. The overall grading scores of cheese containing added lactobacilli were not higher than those for the control cheese (without lactobacilli). A definite correlation was found between the lactobacilli used and the flavours of the cheese. The controlled acidity development during cheesemaking, the fat and the salt in moisture content of the cheeses were not affected. AS

Kefalotyri cheese

- 1110 Litopoulou-Tzanetaki (E). Changes in numbers and kinds of lactic acid bacteria during ripening of kefalotyri cheese. *Journal of Food Science* 55(1); 1990; 111-113

Changes in lactic acid bacteria in ripening Kefalotyri cheese were studied. Throughout ripening lactobacilli and enterococci counts were high (lactobacilli 10^6 - 10^9 /g, enterococci 10^4 - 10^7 /g). *Leuconostocs*, lactic streptococci and betabacteria disappeared early in ripening. *Leuconostoc lactis* and *Streptococcus thermophilus* prevailed initially (23% and 13% resp.). *Enterococcus faecium*, *Lactobacillus casei* and *L. plantarum* became predominant with ripening. After 4 months ripening, *E. faecium* were dominant (35.3%) followed by *L. plantarum* (18.4%) and *L. casei* subsp. *Casei* (15.8%). Results suggested that a starter consisting of both lactic acid bacteria that disappeared early and lactic acid bacteria that survived throughout ripening should be preferable for the production of kefalotyri cheese. AS

Ice cream

- 1111 Flack (E). Ice cream. *Journal of the Society of Dairy Technology* 42(1); 1989; 2-4

Various types of ice cream under UK legislation are described. Essential and optimal ingredients and processing discussed. Economic data on consumption pattern over four yrs is also given. JSS

- 1112 Goff (HD), Kinsella (JE) and Jordan (WK). Influence of various

milk protein isolates on ice cream emulsion stability. *Journal of Dairy Science* 72(2); 1989; 385-397

The adsorption of protein to the fat globule surface in an emulsion such as ice cream mix has a large influence on the resulting emulsion stability and on the fat destabilization process that occurs upon whipping and freezing the mix into ice cream. The performance of several milk protein preparations in an ice cream system have been examined. Enhanced levels of whey proteins at the globule surface, arrived at through either a selective homogenization process or an enhancement of the whey pretein:casein ratio in the mix by addition of whey protein conc. (36% protein), contributed to a decrease in the lipid-serum interfacial tension, a slight increase in mix viscosity, an increase in ice cream dryness upon freezing, and an increase in the amount of fat destabilization in the frozen ice cream. However, 95% whey protein isolate contributed more to desirable properties in the ice cream mix and frozen products. Several caseinates were also examined and sodium caseinate contributed to enhanced overrun in the ice cream but resulted in an emulsion that was too stable to produce the desired degree of fat destabilization upon ice cream manufacture. AS

1113 Schmidt (KA) and Smith (DE). Effects of varying homogenization pressure on the physical properties of vanilla ice cream. *Journal of Dairy Science* 72(2); 1989; 378-384

This study was done to determine how various homogenization conditions affect the physical properties of a 10% milk fat vanilla ice cream. The homogenization pressure studied were double stage 281-35; 141-35; 70-35; 35-35 kg/cm² (4000-500, 2000-500, 1000-500, and 500-500 psi) and single stage 281; 141; 70 and 35 kg/cm² (4000, 2000, 1000, and 500 psi). An unhomogenized sample was also included. Experimental samples made without an emulsifier were compared to a reference sample, homogenized at 141-35 kg/cm² (2000-500 psi) containing an emulsifier system. Factors measured included gloss, overrun stiffness, fat destabilization and mix viscosity. All experimental samples were determined to be the same as the reference sample for overrun and stiffness. Differences were found for gloss with 282-35 and 281 kg/cm² (4000-500 and 4000 psi) samples rated as glossier than the reference sample. Differences were found for fat destabilization, the 282-35 and 282 kg/cm² (4000-500 and 400 psi) samples showing less fat destabilization and the unhomogenized sample more fat destabilization than the reference sample. For mix viscosity,

the 282-35 kg/cm^2 (4000-500 psi) sample was less viscous than the reference sample. AS

Milk powder

- 1114 Oltman (C) and Van Riel (JAM).. Detection of rennet whey solids in skim milk powder and butter milk powder with reversed-phase HPLC. *Netherlands Milk and Dairy Journal* 43(2); 1989; 171-184

This paper describes the procedure for detection of rennet whey solids in skim milk powder and butter milk powder with reverse phase HPLC which is more selective than the existing GPC method. This method is based on the detn. of glycomacropeptides GMP with HPLC on a wide pore reverse phase column with a gradient of acetonitrile in water containing 0.1% of trifluoroacetic acid and GMP detected at 210 nm. The detection limit is 0.2% of rennet whey solids and the identity of the GMP peak was confirmed by comparison of its retention time with that of GMP obtained from purified K-casein and by amino acid analysis after micropreparative HPLC. NGKR

Wheys

- 1115 Turgeon (SL) and Gauthier (SF). Whey peptide fractions obtained with a two step ultrafiltration process. Production and characterization. *Journal of Food Science* 55(1); 1990; 106-110, 157

Whey protein conc. (WPC) and heat-treated WPC (90 C, pH 2.5, 10 min) were hydrolyzed with trypsin and chymotrypsin in an ultrafiltration reactor (PM 30). The total hydrolyzates were further fractionated (PMI) resulting in mixture of polypeptides (M.P.) characterized by a high content of peptides larger than 5000 daltons and fractions made up of amino acids and small peptides (A.A.) rich in small components (< 2000 daltons). The heat treatment of WPC modified the mol. wt. profile of the fractions (M.P. and A.A.) by increasing their content in larger peptides (> 5000 daltons). Suggestions are given for possible food applications for the fractions produced. AS

Milk proteins

- 1116 Smietana (Z), Fornal (L), Szpendowski (J) and Soral-Smietana (M). Utilization of milk proteins and cereal starches to obtain co-extrudates. *Die Nahrung* 32(6); 1988; 545-551

Extrusion of the cereal mixtures with 25% addition of milk proteins of starch. Coeff. of expansion was close to the coeff. of natural cereal flours, but the extrudates were characterized by higher water absorption. Starch was only slightly dextrinized, but it contained more N compounds and mineral salts, and less free lipids. Solubility and swelling power of the extrudates did not change in a way characteristic for cereal starch and flours. Attention should be given to higher content of dietary fibre, pointing to the formation of the starch-lipids and the starch-protein complexes, less susceptible to enzymatic hydrolysis used. Hence it can be stated that the latter increase was apparent only. It can be said that a mixture of cereal starch and milk proteins can be used to modify quality of the extruded products of increased protein content. More attention should be devoted to biochemical characteristics of the protein added, as this largely determines quality of the extruded starch-protein products. AS

MEAT AND POULTRY

Meat

- 1117 Agullo (E), Centurion (ME), Ramos (V) and Bianchi (MA). Determination of total pigments in red meats. *Journal of Food Science* 55(1); 1990; 250-251
- 1118 Ahn (DU) and Maurer (AJ). Effects of added pigments, salt, and phosphate on colour extractable pigment, total pigment, and oxidation-reduction potential in turkey breast meat. *Poultry Science* 68(8); 1989; 1088-1099

Ground turkey breast meat treatments were prepared with 16 contaminations of myoglobin (0.4 mg/g meat), cytochrome C (0, 1 mg/g meat) salt, (NaCl; 1, 2.5%), and sodium tripolyphosphate (0, 5%) before cooking to determine their effect on meat colour, water extractable pigments, total pigment, and oxidation-reduction potential in cooked turkey breast meat. Addition of myoglobin did not increase extractable pigment but significantly ($P < 0.1$) increased the redness (a-value) and total pigment of cooked meat. Cytochrome C greatly increased both extractable pigment and a-values ($P < 0.1$). Most of the added myoglobin was denatured or became unextractable, but almost all of the added cytochrome C was extractable after cooking. A large portion of extractable pigment and drip was

due to cytochrome C; added cytochrome C had a much stronger effect than myoglobin O pinkness of cooked turkey breast meat. Addition of pigments always decreased L-values (lightness) of breast meat. Salt significantly ($P < 0.1$) increased a-values and decreased L- and b-values (yellowness). Extractable pigment was increased by salt in all pigment treatments except myoglobin-added meat; total pigment was hardly affected by salt. Phosphate significantly ($P < 0.1$) increased a-value in no pigment and myoglobin-added meat, but was less effective than salt. Oxidation reduction potentials were decreased by adding salt and phosphate. Those potential changes could have a strong effect on pinkness of cooked turkey breast meat if the oxidation-reduction potentials of the meat are around + 90 mV or -50 mV. AS

- 1119 Amundson (CM) and Sebranek (JG). Factors affecting emulsion capacity as a measure of protein functionality for non-meat proteins. *Journal of Food Science* 55(1); 1990; 267-268, 270

The emulsion capacity (EC) of two commonly used non-meat proteins, isolated soy protein (ISP) and sodium caseinate (SC), was measured by using a var. of conditions. The EC end point for the different proteins was significantly influenced in different ways by environmental conditions. The end point of the ISP was decreased significantly if NaCl was present, if the ISP were added first to water as opposed to oil or if the temp. were increased. The end point of the SC was significantly increased by low NaCl levels, unaffected by order of addition to water or oil and was decreased by increasing temp. Light microscopy demonstrated the structural changes occurring at the EC end points. AS

- 1120 Crouse (JD) and Koohmaraie (M). Effect of time of sampling postmortem on myofibril fragmentation index of meat. *Journal of Food Science* 55(1); 1990; 254-256

The usefulness of myofibril fragmentation index (MFI) in predicting shear force of cooked meat was studied on muscle samples obtained immediately after death and aged or after aging the muscle in the intact carcass for about 7 days. The MFI values of cores obtained at the time of death (MFID) of the animal were lower than those obtained after aging the meat (MFI A) in the intact carcass (69.18 vs. 81.38). However, correlation between MFI values with shear force values were similar for each sampling procedure (MFID, $r = -0.57$; MFI A, $r = -0.60$). Results indicate that the biopsy of animals for MFI observations could possibly be useful in estimating tenderness.

AS

- 1121 Knipe (CL), Rust (RE) and Olson (DG). Some physical parameters involved in the addition of inorganic phosphates to reduced-sodium meat emulsions. *Journal of Food Science* 55(1); 1990; 23-25

The effects of preblending, order of addition and the physical state of alkaline phosphates on the stability of reduced NaCl (0.75%) meat emulsions were determined. Preblending meat batches with reduced NaCl for 16 h resulted in no significant effect upon the stability of meat emulsions, with or without the presence of alkaline phosphates. However, the addition of sodium tripolyphosphate (STPP) and tetrasodium pyrophosphate (TSPP) significantly improved emulsion stability. Neither the order of TSPP addition in relation to that of NaCl nor the physical state of its addition (dry or in solution) affected emulsion stability or the soluble protein level. AS

Beef

- 1122 Alcocer (MJC) and Areas (JAG). Lipid composition and hydration characteristics of lung protein isolates defatted by several solvents. *Journal of Food Science* 55(1); 1990; 19-22, 25
- 1123 Beilken (SL), Macfarlane (JJ) and Jones (PN). Effect of high pressure during heat treatment on the Warner-Bratzler shear force values of selected beef muscles. *Journal of Food Science* 55(1); 1990; 15-18, 42
- 1124 Hwang (S-Y), Bowers (JA), Kropf (DH). Flavour, texture, colour, and hexanal and TBA values of frozen cooked beef packaged in modified atmosphere *Journal of Food Science* 55(1); 1990; 26-29
- 1125 Kinney Sweeten (M), Cross (HR), Smith (GC) and Smith SB). Subcellular distribution and composition of lipids in muscle and adipose tissues. *Journal of Food Science* 55(1); 1990; 43-45, 118
- 1126 Shorthose (WR) and Harris (PV). Effect of animal age on the tenderness of selected beef muscles. *Journal of Food Science* 55(1); 1990; 1-8, 14

Bovines

- 1127 Knipe (CL) and Frye (CB). Characteristics of bovine plasma gels

as affected by pH sodium chloride, and sodium tripolyphosphate. *Journal of Food Science* 55(1); 1990; 252-253

A model system, which simulated the pH, sodium chloride (NaCl), and alkaline phosphate (STP) levels of typical processed meat products, was used to determine the effect of NaCl, STP and pH on firmness and per cent cooked yield of bovine plasma gels. Bovine plasma gel firmness increased with increasing plasma pH, whereas per cent cooked yield was not affected. In contrast, when the pH of the plasma solutions, was adjusted to a constant 5.6 to simulate the pH and buffering of meat, per cent cooked yield was affected; gel firmness was not affected. With increased levels of NaCl and STP, the per cent cooked plasma gel yield increased. AS

Mutton

Sheep

Lambs

- 1128 Carballo (J), Garcia-Matamoros (E) and Colmenero (FJ). Influence of electrical stimulation on lamb quality during frozen storage. *International Journal of Refrigeration* 12(3); 1989; 164-168

The effect of low-voltage electrical stimulation (56 V effective voltage, with polarity reversed every 10S) on lamb carcasses stored frozen for one yr was studied. Non-electrically stimulated carcasses frozen pre-rigor showed evidence of thaw rigor during the first six months of storage in wt. loss, water-holding capacity, and shear strength values. Electrical stimulation and pre-rigor conditioning prevented thaw rigor in the carcasses. No significant differences in protein solubility (in a 5% NaCl solution) were observed between carcasses in the different treatment groups during the frozen storage period. Oxidative rancidity levels remained low throughout storage, regardless of the treatment applied. AS

- 1129 Williamson (G). Purification of glutathione S-transferase from lamb muscle and its effect on lipid peroxidation. *Journal of the Science of Food and Agriculture* 48(3); 1989; 347-360

Lamb muscle contained 0.4 mg glutathione S-transferase (EC 2.5.1.18) per gram of tissue. On storage at 1 C, 20% of the activity was lost after 3 wks. Glutathione S-transferase was

isolated from lamb muscle by affinity chromatography on S-hexylglutathione Sepharose 6B. One major form of the enzyme was present in the purified preparation, a dimer with subunit mol. wt. of 22900 and isoelectric point of 6.7. This enzyme fits into the Pi class on the basis of substrate specificity. Linoleic acid hydroperoxides and trans, trans-2,4-decadienal, products of linoleate peroxidation were both substrates (0.11 and 0.24 $\mu\text{mol min}^{-1} \text{mg}^{-1}$ protein resp.). Glutathione S-transferase inhibited copper-stimulated peroxidation of arachidonate in the presence of glutathione. The inhibition was only slightly less efficient in the absence of glutathione. The later effect probably arises from the presence of enzyme-bound glutathione (4.5 mol mol⁻¹ enzyme subunit) and also from a small but significant glutathione-independent peroxidase activity. The latter was detected using an HPLC assay which monitors formation of product directly. Reduced glutathione per se showed only a slight inhibition of arachidonate peroxidation. AS

Pork

- 1130 Astiasaran (I), Sanchez-Monge (JM), Villanueva (R) and Bello (J). Modifications of the nitrogen fraction in the white pork ham during the curing process. *Revista de Agroquímica Y Tecnología de Alimentos* 29(1); 1989; 99-106 (Es).
- 1131 Trout (GR), Chen (CM) and Susan Dale. Effect of calcium carbonate and sodium alginate on the textural characteristics, colour and colour stability of restructured pork chops. *Journal of Food Science* 55(1); 1990; 38-42

Poultry

Chickens

- 1132 Hilary Stevenson (M) and Gray (R). Effect of irradiation dose, storage time and temperature on the ESR signal in irradiated chicken bone. *Journal of the Science of Food and Agriculture* 48(3); 1989; 269-274

Two-hundred pairs of chicken bones (drumsticks) were irradiated at 2.5, 5.0, 7.5 and 10.0 kGy and stored for 0, 7, 145, 21 and 28 days at -20 °C or + 5 °C thus giving five replicates per treatment. Five unirradiated pairs of bones were stored at 5 °C, one sample being analysed at each storage time. The samples were fragmented, freeze dried and ground prior to detn. of the free radical concn. using electron spin

resonance (ESR) spectroscopy. ESR signal strength increased significantly as irradiation dose increased, and decreased with storage time. Temp. alone had no significant effect on free radical concn. but, as the storage time increased, the bones stored at 5 Degreee C showed a significantly greater reduction in free radical concn. than those stored at -20 C. Correction of the ESR signal to a standard P or Ca concn. did not significantly reduce the variability of the results but did eliminate the interaction between storage temp. and storage time. AS

- 1133 Schlemann (J), Wolm (G), Schrodter (R) and Ruttloff (H). Chicken flavour - formation, composition and production. Part 2. Flavour substances *Die Nahrung* 32(6); 1988; 595-607 (De).

Similar to all types of meat flavours there are obviously no key substances existing for chicken flavour, too. Despite of this statement selected classes of volatile compounds are thought to be essential for this type of flavour as for example sulphur and carbonyl compounds. With the presented paper being part of a set of publications in three parts a review of the current level of knowledge in this field is given. AS

- 1134 Stevenson (MH) and Gray (R). An investigation into the effect of sample preparation methods on the resulting ESR signal from irradiated chicken bone. *Journal of the Science of Food and Agriculture* 48(3); 1989; 261-267

Results are presented giving details of the effect of six different methods of sample preparation on the free radical concn. in irradiated chicken drumsticks. Comparisons were made using electron spin resonance spectroscopy. Freeze drying and grinding was found to be the preferred method of sample preparation. AS

- 1135 Young (H), MacFie (HJH) and Light (N). Effect of packaging and storage on the sensory quality of cooked chicken menu items served from chilled vending machines. *Journal of the Science of Food and Agriculture* 48(3); 1989; 323-338

This study examined the effects of packaging on the sensory qualities of two cooked chilled foods (deep fried chicken drumsticks and chicken a' la king) after extended chilled storage. Quantitative descriptive analysis was used with a trained taste panel to score the sensory attributes of the two products at various stages of chilled storage up to a max. of 14 days at 0.3 C. Storage had a significantly (P

<0.05) deleterious effect on all the sensory attributes of chicken drumsticks. Just over half the sensory characteristics of chicken a' la King were significantly affected and these effects were mainly concerned with appearance. Vacuum and modified atm. packaging extended the shelf life of both products in the sense that the changes in sensory attributes after 11-14 days were the same as in the cling-film-wrapped products after 4 days. The vacuum and modified atm. treatments were almost indistinguishable in their effects on the sensory attributes. AS

Broilers

- 1136 Asghar (A), Lin (CF), Gray (JI), Buckley (DJ), Booren (AM) and Flegal (CJ). Effects of dietary oils and alpha-tocopherol supplementation on membranal lipid oxidation in broiler meat. *Journal of Food Science* 55(1); 1990; 46-50, 118

The effects of different dietary oils and alpha-tocopherol on the fatty acid comp. of mitochondrial and microsomal lipids of broiler muscle and their lability to NADPH-induced peroxidation were investigated. Fatty acid comp. of both neutral lipids and phospholipids of mitochondria and microsomes was influenced by dietary oil comp. Supplementation of the diet with tocopherol only appeared to increase the alpha tocopherol concn. in the microsomal membranes in the dark meat. The rate of NADPH-induced lipid peroxidation in microsomes and mitochondria was dependent primarily on the fatty acid comp. of the membrane lipids, and to a lesser extent on the alpha-tocopherol content. AS

- 1137 Pikul (J) and Kummerow (FA). Lipid oxidation in chicken muscles and skin after roasting and refrigerated storage of main broiler parts. *Journal of Food Science* 55(1); 1990; 30 - 37

The muscles and attached skin of fresh chicken broiler parts, which were roasted in a convection oven and subsequently kept at 4 C for 4 days were analyzed for lipid oxidation products (LOP). Roasting and refrigerated storage significantly increased the amount of malonaldehyde which occurred faster in the skin than in the muscles. Also, after roasting, lipid oxidation fluorescence products increased in the aqueous phase and, after refrigerated storage, in the organic phase of Folch extracted muscles and skin. The lowest concn. of LOP was found in roasted, separated parts of broilers, especially in the drumsticks and wings as opposed to roasted carcass halves or quarters. The absolute amount of LOP in muscles and skin after

roasting was a result of initial concn. of LOP in raw samples and the type of roasted broiler parts. AS

Turkeys

- 1138 Denton (JH) and Gardner (FA). Effect of product from on the microbiological growth support characteristics of turkey meat products. *Poultry Science* 67(9); 1988; 1269-1273

Poultry products

Eggs

- 1139 Rauch (P), Hochel (I) and JanKas. Sandwich enzyme immunoassay of hen egg lysozyme in foods. *Journal of Food Science* 55(1); 1990; 103-105

A sandwich enzyme immunoassay was developed to determine the concn. of hen egg lysozyme added as an antimicrobial agent to preserve food. The method enabled detn. of egg lysozyme in beverages, milk and cheeses at a concn. as low as 1 ng/mL with an accuracy of plus or minus 12%. The recovery of the method was 85-105%. Human serum albumin (1%) was the most suitable protein for suppressing non-specific binding. AS

Egg yolks

- 1140 Blackwelder (JA) and Pike (OA). Oxidative stability of cholesterol-free egg lipid fractions. *Journal of Food Science* 55(1); 1990; 92-94, 113

Lipids were extracted from fresh egg yolk using hexane:isopropanol (3:2, v/v) and separated on a silicic acid column into triacylglycerol (TG), phospholipid (PL), cholesteryl ester and cholesterol fractions using hexane, ethyl acetate and methanol. TG and PL fractions were cholesterol-free. Oxidative stability at 35 C of crude lipids, TG, PL and combined TG + PL was evaluated over 12 days by measuring conjugated dienes, conjugated trienes and thiobarbituric acid reactive substances. PL and TG exhibited significantly higher oxidation than the crude lipids ($\alpha = 0.01$). Combined TG+ PL was not significantly different than the crude lipids ($\alpha = 0.01$), showing much higher stability than individual TG or PL fractions. AS

- 1141 Woodward (SA). Texture of cooked egg yolk as influenced by physical manipulation of raw egg yolk and salt brining of shell

eggs. *Poultry Science* 67(9); 1988; 1264-1268

Two exp. were conducted to determine the effects of various degrees of manipulation of raw yolk on the final texture of cooked egg yolk. Hardness, cohesiveness, and springiness of cooked yolk increased as manipulation of raw yolks became more severe. All treatments were compared with a control of yolks from hard-cooked eggs. Minor disturbances, such as breaking out eggs into beakers, separating yolks from albumen, and rolling separated yolks on damp cheese cloth, caused minor changes in texture. Pouring or stirring raw yolks prior to cooking increased hardness by 5 times that of undisturbed yolks. Shaking eggs in a microbiological shaker for 5 min at 400 or 500 rpm or for 60 min at 300 rpm caused significant increase in hardness, cohesiveness, and springiness of subsequently hard cooked yolks. In a third exp. shell eggs were held in salt brines for up to 4 wks. The infusion of salt into the eggs altered the appearance and yolk index of raw yolks, but caused only slight changes in the texture profiles of cooked yolks. AS

SEAFOODS

Mussels

- 1142 Serra (JA), Marine (E) and Escriche (I). Iron, zinc, copper, manganese, cadmium and lead contents in mussel (*Mytilus edulis* L.). *Revista de Agroquímica Y Tecnología de Alimentos* 29(1); 1989; 131-136 (Es).

The contents of Fe, Zn, Cu, Mg, Cd and Pb in 20 series of samples of mussels collected from the entire life cycle (October-July) were determined by atomic absorption spectrometry. The evolution of the content with the age of the mussel was analyzed finding that in no case did the concn. of these elements exceed the max. authorized by the current Spanish legislation. AS

Shellfish

- 1143 Yoon (KS) and Lee (CM). Effect of powdered cellulose on the texture and freeze-thaw stability of surimi-based shellfish analog products. *Journal of Food Science* 55(1)87-91;

The cryoprotective property in surimi and the texture-

modifying and freeze-thaw stabilizing properties in molded (shrimp-type) and fiberized (crab leg-type) products of powdered cellulose were studied using Instron testing and sensory evaluation. Particle size, level and manner of incorporation of cellulose with varying combinations of modified starch of sorbitol/sucrose were the main parameters studied. In both molded and fiberized products, compressive force (cohesiveness) and penetration/shear force (firmness) decreased with an increased concn. of cellulose. Cellulose significantly modified texture at 2% by reducing the increase in firmness after freeze-thaw cycles. Substitution of 2% cellulose for modified starch in surimi-based products or for cryoprotectants in surimi did not alter freeze-thaw stability. AS

Fish

- 1144 Kitamikado (K), Yuan C-S and Ueno (R). An enzymatic method designed to differentiate between fresh and frozen-thawed fish. *Journal of Food Science* 55(1); 1990; 74-76

A fluorometric method and a rapid paper test method were developed for differentiating fresh from frozen-thawed fish. The methods were based on measurement of the activity of neutral Beta-N-acetylglucosaminidase. This enzyme, found in fish red blood cells, was inactive in intact cells but was activated when cells were disrupted by freezing and thawing. Both methods were applicable for testing most common edible fish prior to filleting and required about 20 min using a UV lamp. AS

- 1145 Rao (CVN) and Antony (KP). A multipurpose light weight container for transport of fresh iced fish. *Packaging India* 22(1); 1989; 21-22

This paper explains as to how to overcome certain problems in the current method of packaging, efforts are being made to develop alternative packages from corrugated polypropylene board for iced fish transportation in view of the several advantages it offers. SRA

- 1146 Wang (YJ), Miller (LA), Perren (M) and Addis (PB). Omega-3 fatty acids in Lake Superior fish. *Journal of Food Science* 55(1); 1990; 71-73, 76

Proximate analysis and fatty acid comp. of eight commercially imported sp. of Lake Superior fish were determined. Palmitic acid (C16:0) was the predominant saturated

fatty acid, accounting for 68-79% of total saturated acids. Oleic acid (18:1) was the most abundant monounsaturated fatty acid. Linoleic acid (C18:2), linolenic acid (C18:3), eicosapentaenoic acid (C20:5) and docosahexaenoic acid (C22:6) were the predominant polyunsaturated fatty acids. Brining, smoking and refrigerated storage caused a reduction in total lipid, but only a small loss in n-3 fatty acids. The data revealed that most Lake Superior fish examined were excellent sources of polyunsaturated fatty acids with very high levels of omega-3 (n-3) fatty acids, especially eicosapentaenoic and docosahexaenoic acids. AS

Albacore

- 1147 Pozo (RG), Saitua (ES), Uncilla (I) and Monotoya (JA). Simultaneous determination by HPLC of fat-soluble vitamins in albacore (*Thunnus alalunga*). *Journal of Food Science* 55(1); 1990; 77-78

The fat-soluble vitamins A, D, and E were determined by a liquid chromatographic method. The vitamins were extracted from the tissues with chloroform and methanol, saponified and separated on a Lichrosorb normal phase column followed by VUV detection. Recoveries of added vitamins in liver samples were 93.0% for vitamin A, 90.0% for vitamin D and 92.1% for vitamin E. The results from a study of fat-soluble vitamins in samples of albacore showed that the vitamin A and D were found only in fish liver and vitamin E was found in the liver and the edible muscle. AS

Cod

- 1148 Greene (DH) and Bernatt-Byrne (EI). Adenosine triphosphate catabolites as flavour compounds and freshness indicators in pacific cod (*Gadus macrocephalus*) and pollock (*Theragra chalcogramma*). *Journal of Food Science* 55(1); 1990; 257-258

Postmortem formation of 5'-inosine monophosphate, inosine and hypoxanthine in Pacific cod and pollock fillets during chilled storage was monitored over a two wk period. Accumulation of hypoxanthine in Pacific cod (*Gadus macrocephalus*) fillets proceeded more slowly than has been reported for Atlantic cod (*Gadus morhua*) but similar to North Sea cod (*Gadus callarias* L.). For both cod and pollock, hypoxanthine was negatively correlated with flavour and desirability ($P < 0.01$), while both inosine and 5'-inosine monophosphate were positively correlated with overall

desirability ($P < 0.01$). AS

Mackerels

- 1149 Santos (EEM) and Regenstein (JM). Effects of vacuum packaging, glazing, and erythorbic acid on the shelf-life of frozen white hake and mackerel. *Journal of Food Science* 55(1); 1990; 64-70

The quality changes during frozen storage of two underutilized sp. of fish: mackerel (*Scomber scombrus*), a fatty sp., and white hake (*Urophycis tenuis*), a non-fatty, gadoid sp., with or without a bag, vacuum, and/or erythorbic acid, were measured using the dimethylamine (DMA) test for hake and the thiobarbituric acid (TBA) test for mackerel, and by Instron deformation, expressible moisture, thaw drip, cook loss, and sensory evaluation for both sp. Texture deterioration and lipid oxidation limited the shelf-life of hake and mackerel, resp. Air (oxygen) prolonged the shelf-life of hake but lessened that of mackerel. Erythorbic acid accelerated the rate of texture deterioration in hake but inhibited the rate of lipid oxidation in mackerel. AS

Sardines

- 1150 Zuberi (R), Shamshad (SI) and Qadri (RB). Bacterial flora of fermented fish sauce prepared from sardines in Pakistan. *Tropical Science* 28(4); 1988; 239-246

The investigation was to isolate and identify the microflora of fish sauce prepared from sardines and halophilic nature of the organisms. Five different samples of fish sauce were examined for their residual bacterial flora. Total of hundred bacteria strains were isolated and identified. The microflora were *Bacillus* sp. followed by *Micrococcus* sp. Among the bacilli, *B. megalaris* is dominating which is followed by *B. licheniformis*, *B. pumilus* and *B. cereus*. It was found that the salt tolerance behaviour of the isolates was not constant for a particular sp. of *Bacillus* but varied from 0.15% requirement of NaCl among different strains of the same sp. SRA

Threadfin-bream

- 1151 Toyahara (H), Kinoshita (M) and Shimizu (Y). Proteolytic degradation of threadfin-bream meat gel. *Journal of Food Science* 55(1); 1990; 259-260

The textural degradation of threadfin-bream meat gel accompanying the breakdown of the myosin heavy chain was caused not by a heatstable alkaline proteinase (HAP) but by a newly found gel degradation inducing factor (GIF). GIF as well as HAP was recovered in the sarcoplasmic fraction, but GIF was separated from HAP by gel filtration on Ultrogel AcA 34. This factor showed strong proteolytic activity against the myosin heavy chain at pH 7.0 in the presence of 2.5% NaCl. AS

Tilapia

- 1152 Tave (D), Lovell (RT), Oneal Smitherman (R) and Rezk (M). Flesh and peritoneal lining colour of gold, bronze, and black *Tilapia mossambica*. *Journal of Food Science* 55(1); 1990; 255-256

Flesh colour of gold (homozygous recessive gg), bronze (heterozygous Gg), and black (homozygous dominant GG) *Tilapia mossambica* was evaluated sensorily (visually). Gold fish had white flesh, while black and bronze fish had flesh that had a grayish tint. Flesh colour of gold fish was significantly lighter than that of both black and bronze fish ($P = 0.001$). Flesh colour of bronze and black fish did not differ. Peritoneal lining of the abdominal cavity of black fish is black, that of gold fish is white, and that of bronze fish is spotted and quite variable. The peritoneal lining of black fish must be removed when they are marketed whole to remove the black pigmentation, but this is not necessary with gold fish. AS

Tuna

- 1153 Wei (CI), Chen (C-M), Koburger (JA), Otwell (WS) and Marshall (MR). Bacterial growth and histamine production on vacuum packaged tuna. *Journal of Food Science* 55(1); 1990; 59-63

Vacuum and non-vacuum packaged samples of tuna or tuna spiked with *Klebsiella oxytoca* T₂, *Morganella morganii* JM or *Hafnia alvei* T₄ were stored at 2 C and 10 C and examined for bacterial growth and histamine production on day 3, 6, 10 and 15, unlike those stored at 2 C. Tuna samples stored at 10 C showed significant bacterial growth over time and had high levels of histamine ($> 200\text{mg}/100\text{g}$ tuna on day). Vacuum packaging did not show any beneficial effect in controlling bacterial growth and histamine production on tuna samples at these two temp. Low temp. storage was more effective than vacuum packaging in controlling histamine production by the

bacteria tested. AS

Whittings

- 1154 Chang-Lee (MV), Lampila (LE) and Crawford (D). Yield and composition of surimi from Pacific whiting (*Merluccius productus*) and the effect of various protein additives on gel strength. *Journal of Food Science* 55(1); 1990; 83-86

Based on round fish wt., the yields from processing Pacific whiting into surimi included 43.3% planks, 36.2% minced flesh, 23.8% washed and pressed flesh, 19.5% refined flesh and 21.4% surimi (91.7% refined flesh plus 8.3% cryoprotectants). After washing (3:1; water:minced flesh) and pressing twice, 40.6% of the original lipid and 77.4% of the original ash were removed from the minced flesh. Surimi contained 54% extractable myofibrillar protein. Egg white (EW), whey protein conc. and soy protein isolate at 0 to 5.0% levels were evaluated as protein additives to heat-set gels. EW at the 3.0% level produced superior gel hardness and elasticity (P less than or equal to 0.05). AS

Products

Fish oils

- 1155 Mieth (G), Wirth (M) and Weigelt (E). Production of n3-fatty acid concentrates of fish oils. Part 1. Concentration by urea complex. *Die Nahrung* 33(5); 1989; 481-483

PROTEIN FOODS

- 1156 Mitchell (GV), Jenkins (MY) and Grundel (E). Protein efficiency ratios and net protein ratios of selected protein foods. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 53-58

As a part of a cooperative study initiated to assess both in vitro protein quality methods, the protein efficiency ratio (PER) and net protein ratio (NPR) of 15 different protein sources were determined. Male weanling Sprague-Dawley rats were fed a 10% protein diet. Fourteen-day NPR and relative NPR (RNPR) values and 14 and 28 days PER and relative PER (RPER) values were calculated for each protein source. When protein quality values were expressed relative to ANRC casein, the 14-

and 28-day PER data ranked the protein sources essentially in the same order. RPER values of non-fat dried skim milk (unheated) and tuna were more than 100% that of casein; non-fat dried skim milk (heated), chickpeas, and breakfast sausage were between 50% and 70% of that of casein; and pinto beans and rice-wheat gluten cereal did not support substantial growth of the rat. The NPR method did not always rank the protein sources in the same order as the PER method. For the poor quality proteins, RNPR values were much higher than the RPER values; however, the RNPR and RPER values agreed closely for high quality protein sources. AS

Infant foods

- 1157 Lee (TW), Bobik (JrE) and Malone (W). Determination of fat in infant formula by robotic automated method. *Journal of the American Oil Chemist's Society* 66(10); 1989; 1480-1483

A method has been developed for the detn. of fat in infant formula using a commercially available robotic system. The procedure and chemistry at large are the same as the manual method, Official Method of Analysis 16.064, by the Association of Official Analytical Chemists (AOAC). Both liquid and powder forms of milk-protein-based and soy-protein-based matrices were analyzed in this study. The robotic operations are described in detail. The evaluation of the accuracy is accomplished by comparing the data obtained by the robotic automated method to those obtained by the Official Manual Method. The analysis of variance does not indicate a statistically significant difference (p-value 0.0620, mean differences 0.0056%) between the mean results of the two methods for the milk-protein-based infant formula. The results of other matrices tested by both methods agreed within 1% relative of each other. The precision of the robotic automated method is slightly better than the manual method as shown by the overall relative standard deviation (RSD) of 0.167% vs 0.269%. The ruggedness of the instrument has been satisfactory. The results of this study suggest that the robotic automated method is suitable for this application. AS

- 1158 Nout (MJR), Rombouts (FM) and Havelaar (A). Effect of accelerated natural lactic fermentation of infant food ingredients on some pathogenic microorganisms. *International Journal of Food Microbiology* 8(4); 1989; 351-361

Accelerated natural lactic fermentation in mixtures of water and ground sorghum, millet and pigeon pea was obtained by

gradual selection of lactic acid bacteria, through inoculum recycling. Weaning food prepared from ingredients fermented this way, contained approx. 0.7% lactic acid and 0.05% acetic acids and had a pH of about 3.8. In porridges, a pH of less than or equal to 4.0 was required to cause death of *Salmonella typhimurium* and *Staphylococcus aureus*. Several intestinal pathogenic bacteria were inoculated into sour porridge. The most resistant *Salmonella* spp. died at a rate of 1.2 log cycle/h; the most resistant *Shigella* sp. at 0.9 log cycle/h; and the most resistant *Escherichia coli* strain at 0.6 log cycle/h. A yeast *Candida albicans*, could grow well in the sour product, whereas a bacteriophage (MS-2) was inactivated at a rate of 0.1 log cycle/h. In the acid-sensitive bacterial cultures, no gradual adaptation to acid environments could be observed. The survival studies were carried out at 30 C. AS

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Beer

- 1159 Fuhrer (R). Pasteurization unit for beer. *Lebensmittelindustrie* 36(4): 1989; 174-175 (De).

Wines

- 1160 Grassin (C) and Dubourdieu (D). Quantitative determination of *Botrytis* laccase in musts and wines by the syringaldazine test. *Journal of the Science of Food and Agriculture* 48(3): 1989; 369-376

The syringaldazine assay was adapted for quantitative detn. of laccase (EC 1.10.3.2) activity from *Botrytis cinerea* Pers in musts and new wines. This colorimetric method is fast, specific and sensitive. It makes it possible to assess the level of contamination of crops by *Botrytis cinerea*. The assay can be performed in the presence of tyrosinase but the phenolic compounds of the grape must first be eliminated because of their inhibition of syringaldazine oxidation by laccase. When measured in botrytised grape, laccase activity is related to the stages of development of the fungus. AS

- 1161 Karovicova (J), Dradak (M), Polonsky (J) and Malik (F). The relation between acidity and the representation of acids in red

wines. *Die Nahrung* 33(5); 1989; 473-475

- 1162 Perez (R), Salvador (MD), Melero (R), Nadal (MI) and Gasque (F). Dealcoholization of wine by column distillation. Previous assays. *Revista de Agroquímica Y Tecnología de Alimentos* 29(1); 1989; 124-130 (Es).

Red wines was dealcoholized in a pilot equipment by vacuum distillation at 37 °C. Dealcoholized wine, top condensed and non-condensed aromatic compounds have been collected. Control test and GLC analysis were used to evaluate process recovery and main volatile compounds distribution. Linalool and 2,3-butanediol were recovered almost completely in the dealcoholized wine, while more volatile compounds were distributed in other fractions. AS

Non-alcoholic beverages

Coffee

- 1163 Meister (U) and Puhlmann (R). Degassing behaviour of roast coffee. *Lebensmittelindustrie* 36(4); 1989; 155-158 (De).

This paper examines the degassing behaviour of roasted coffee beans and ground coffee as dependant on the different roasting and grinding procedures by a pressure less measuring method. The significance of roasting temp., time, degree, and grinding fineness to the necessary intermediate storage of the roasted coffee before package is discussed. Also covered is the sensory changes of the coffee drink during intermediate storage in the presence of oxygen. BV

- 1164 Puhlmann (R), Gresse (G), Riesberg (H) and Fleck (HJ). New method of the manufacture of very rich coffee. *Lebensmittelindustrie* 36(4); 1989; 164-166 (De).

The Institute for Getreideverarbeitung has developed a new simple procedure for the production of high-yield ground roast coffee. The procedure commercially tested and put into generation at VEB Kaffee Halle is described and explained at the example of roasted coffee mixes already produced. BV-

- 1165 Puhlmann (R) and Habel (G). Examination to test the grinding behaviour of roasted coffee. *Lebensmittelindustrie* 36(4); 1989; 161-163 (De).

The influence of the coffee var., the roasting degree, the

moisture content as well as of the grinding parameters upon the grinding result is discussed with particular reference to grinding roasted coffee in a roller mill. BV

- 1166 Puhlmann (R) and Meister (U). Process analysis and technology of the roasting of coffee. *Lebensmittelindustrie* 36(4); 1989; 159-160 (De).

The authors describe the analysis of the roasting process, continuous measuring of the temp. and the discontinuous ascertainment of the colour (roasting degree), the moisture content and the sensory properties of roasted coffee or of coffee brew. BV

- 1167 Puhlmann (R), Meister (U) and Mantey (R). Technology of the manufacture of roast coffee. *Lebensmittelindustrie* 36(4); 1989; 167-169 (De).

- 1168 Speer (K) and Mischnick (P). 16-O-Methylcafestol-A new diterpene in coffee. Discovery and identification. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(3); 1989; 219-222 (De).

Fruit juices

- 1169 Chandler (BV). Fruit juice review. 1. *Food Technology in Australia* 41(9); 1989; 926-928

This review covers raw materials, juice processing (citrus juices, other juices) packaging and storage of fruit based beverages, fruit juice analysis, orange juice authentication, apple juice authentication and industry matters. SRA

Bilberry juices

- 1170 Azar (M), Verette (E) and Brun (S). Comparative study of fresh and fermented bilberry juices state and modification of the colouring pigments. *Journal of Food Science* 55(1); 1990; 164-166

Rapid and direct methods for the detn. of the colouring pigments were applied to fresh and fermented bilberry juices-*Vaccinium myrthillus* as well as to their fractionation products isolated by preparative column chromatography. These methods were: bisulphite decolourization, chromatic indices and analytical column chromatography for the appreciation of the different pigment states. Results obtained from these exp.

gave an estimation and comparison of the states and the forms of the colouring pigments and underlined the effects of the physicochemical treatments such as condensation or degradation of pigments during fermentation, preservation and experimental procedures. AS

Orange juices

- 1171 Imai (T), Harte (BR) and Giacini (JR). Partition distribution of aroma volatiles from orange juice into selected polymeric sealant films. *Journal of Food Science* 55(1); 1990; 158-161

The sorption of organic volatiles from orange juice by polymeric food contact materials was investigated. Three sealant films were evaluated, a commercial low density polyethylene and two developmental films, an ethylene vinyl alcohol co-polymer of high ethylene content and co-polyester. Samples of the films were immersed in the juice for 24 days at 22 C and the level of sorbed volatiles monitored as a function of time. Three probe compounds (d-limonene, neral and geranial) were selected as being representative of orange juice flavour components. A gas chromatographic technique was developed to quantify the level of probe compounds in juice and films. Results compared to the more traditional bromide-bromate titration method. Sorption of organic volatiles by one of the developmental films (co-polyester) was significantly lower than the others. AS

- 1172 Kimball (DA) and Norman (SI). Changes in California naval orange juice during commercial debittering. *Journal of Food Science* 55(1); 1990; 273-274

The nutritional and compositional changes (via adulteration screenings) in California naval orange juice during commercial debittering using a hydrophilic absorbent were studied. Both reconstituted and freshly extracted juices were analysed. There were significant reductions in limonin, citrus oils and pulp. Citrus oils and pulp can be replenished without violation of federal standards of identity. Increase in mineral content resulted from the use of mineral-laden water for reconstituting conc. before treatment and not from the use of the absorbent. AS

- 1173 Lee (HS) and Nagy (S). Formation of 4-vinyl guaiacol in adversely stored orange juice as measured by an improved HPLC method. *Journal of Food Science* 55(1); 1990; 162-163, 166

4-Vinyl guaiacol, a potent off-flavour compound in orange juice, was isolated by using a C-18 cartridge and analyzed by high performance liquid chromatography (HPLC) with fluorescence detection. The new HPLC method possessed a sensitivity of 10 p.p.b for 4-vinyl guaiacol and was at least 5 to 10 times more sensitive than previously reported gas-liquid chromatographic procedures. Storage of bottled orange juice for 18 wk yielded the following 4-vinyl guaiacol levels; 42 μ g/L (20 C), 223 μ g/L (30 C), and 778 μ g/L (40 C). Concentration of 4-vinyl guaiacol increased with storage time at all storage temp.; however, a noticeable decrease occurred after extended storage at 50 C. AS

FATS AND OILS

- 1174 Mosandl (AL) and Kustermann (A). Stereoisomeric flavour compounds. XXX. HRGC-analysis of chiral-lactones from beverages and fruit-preparations. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(3); 1989; 212-215 (De).

The first direct chirospecific analysis of 4-alkyl-substituted Gamma-lactones from fruit nectars and some other commercially available fruit-containing preparations is reported by off-line coupling of HPLC with HRGC on heptakis (3-O-acetyl, 2,6-di-O-pentyl)-beta-cyclodextrin as a suitable chiral stationary phase. AS

- 1175 Parizkova (H), Pokorny (J), Davidek (J) and Kminek (M). Effect of polar substances on the decomposition of hydroperoxy oleate on heating. *Die Nahrung* 33(5); 1989; 477-479
- 1176 Quinlan (ME) and Jenner (MR). Analysis and stability of the sweetener sucralose in beverages. *Journal of Food Science* 55(1); 1990; 244-246

The stability of the sweetener sucralose in a range of prototype beverages was confirmed. Storage conditions were chosen to encompass the typical shelf life of the products under investigation plus some extreme conditions. The methods developed for the analysis of the beverages used high performance liquid chromatography with refractive index detection. The reproducibility of each method was determined by means of recovery exp. Stored samples were also subjected to sensory evaluation. Sucralose was stable under all the

conditions tested thus demonstrating the potential suitability of this sweetener in soft drinks. AS

Oils

- 1177 Akoh (CC) and Swanson (BG). Optimized synthesis of sucrose polyesters. Comparison of physical properties of sucrose polyesters, raffinose polyesters and salad oils. *Journal of Food Science* 55(1); 1990; 236-243

Synthesis and purification of sucrose polyesters (SPE) were optimized to obtain high yields of SPE. Sucrose octaacetate (SOAC) and fatty acid methyl esters (FAME) of salad oils or FAME blends of homogenous fatty acids and salad oils were interesterified in the presence of sodium metal. Yields 99.6-99.8% of purified SPE based on initial wt. of SOAC were obtained. SPE structure was confirmed by infrared (IR) and C-13 nuclear magnetic resonance (C-13 NMR) spectroscopy. Physical properties of SPE and raffinose polyesters (RPE) were similar to physical properties of conventional salad oils. The hydrophile-lipophile balance (HLB) of SPE and RPE were between 2-6 HLB units. Differential scanning calorimetry (DSC) was used to determine the melting properties of SPE and RPE. Neither SPE nor RPE was susceptible to *in vitro* lipolysis. AS

- 1178 Elizalde (BE), Pilosof (AMR) Dimier (L) and Bartholomai (GB). Kinetics of demulsification of food protein-stabilized oil-in-water emulsions. *Journal of the American Oil Chemist's Society* 66(10); 1989; 1454-1458

Demulsification of food protein stabilized oil-in-water emulsions was determined as a function of time. Demulsification conformed to the empirical equation $q' = \frac{Q}{B+t}$, where q' is the increase in moisture content of the down layer of emulsions at time t , Q is the max. increase in moisture content, and B is the time required to gain $Q/2$. Emulsions separate water according to a second order rate law, which would indicate that flocculation is the rate determining step in demulsification. AS

- 1179 Erciyes (AT), Karaosmanoglu (F) and Civelekoglu (H). Fruit oils of four plant species of Turkish origin. *Journal of the American Oil Chemist's Society* 66(10); 1989; 1459-1464

The characteristics of fatty oils recovered from seeds of four plant sp. of Turkish origin have been investigated. Seed

oils of *Rhus coriaria* L. and *Ecballium elaterium* (L.) A. Rich. showed a close resemblance to those of previously published reports. Oil extracted from the seed of *Celtis australis* L. and *Gundelia tournefortii* L. show characteristics similar to fruit oils of the plant families to which they belong. In the focus of their technological evaluation, *Ecballium elaterium* seed oil can be regarded as a typical drying oil, while the others show characteristics of semidrying oils. AS

- 1180 Han (D), Yi (OS) and Shin (HK). Antioxidative effect of ascorbic acid solubilized in oils via reversed micelles. *Journal of Food Science* 55(1); 1990; 247-249

Ascorbic acid was solubilized in oils via reversed micelles using phosphatidyl choline as surfactant and water. The effect of the solubilized ascorbic acid on the oxidative stability of fish and soybean oils was investigated in terms of peroxide value in the absence and presence of rosemary extract of Delta-tocopherol. The autoxidation of the oils was greatly retarded with the ascorbic acid compared to the natural antioxidants used. The ascorbic acid also exerted a synergistic effect with Delta-tocopherol in fish oil. AS

- 1181 Jones (JM). Tropical oils. Truth and consequences. *Cereal Foods World* 34(10); 1989; 866-871

The author has reviewed the work carried out so far on the effect of the tropical oils such as palm oil and coconut oil containing high amount of saturated fatty acids on the serum cholesterol level and the rate at which cancers grow. The presence of abundance amount of tocotrienols distinguishes from other vegetable oils and the data showed that increasing the amount of tocotrienols in the diet decreases the cholesterol levels in the serum. The author has also highlighted the beneficial effects of using palm oil in the diet. PHR

- 1182 Przybylski (R) and Hougen (FW). Simple method for estimation of volatile carbonyl compounds in edible oils and fried potato chips. *Journal of the American Oil Chemist's Society* 66(10); 1989; 1465-1468

A simple and sensitive method has been devised to determine the amounts of volatile carbonyl compounds in vegetable oils and fried potato chips, using a chemical reaction trap and absorption spectrophotometry. A sample of oil or fried potato chips is heated and simultaneously purged

with a flow of N gas which further bubbles through a tube (trap) containing a hydroxylamine hydrochloride solution. The volatile carbonyl compounds are removed from the sample with the purge gas and retained in the trapping solution as they react to form the less volatile oxime derivatives. These are subsequently estimated by ultraviolet absorption, at wavelength 212 nm for the total oximes and at 272 nm specifically for conjugated diene carbonyl oximes, including furfural if present. Volatile carbonyls can be determined by this methods at levels as low as 0.1-0.5 p.p.m. of the sample. The method has been applied to the analysis of samples of canola (low erucic acid rapeseed) oil, cottonseed oil, and potato chips, all before and after storage. The method should be suitable also for other types of fried food. AS

Rice bran oils

- 1183 Bhattacharyya (S) and Bhattacharyya (DK). Biorefining of high acid rice bran oil. *Journal of the American Oil Chemist's Society* 66(10); 1989; 1469-1474

Rice bran oil with a high free fatty acid content (FFA) after degumming and dewaxing can be converted into edible quality oil of satisfactory refining characteristics by first adopting the biorefining process to reduce the major portion of the FFA by converting them into neutral glycerides with the aid of 1,3-specific lipase under optimum conditions and later deacidifying the residual FFA of the biorefined oil by alkali neutralization. AS

SPICES AND CONDIMENTS

Spices

- 1184 Kivanc (M). Antimicrobial activity of "Cortuk" (*Echinophora sibthorpiana* Guss.) spice, its essential oil and methyl-eugenol. *Die Nahrung* 32(6); 1988; 635-637

Echinophora sibthorpiana Guss. [*E. tebuifolia* L. subsp. *sibthorpiana* (Guss) Tutin; *Chrysosciadium sibthorpiatum* (Guss) Tamamsch.] is a biennial or perennial plant (Fam. Umbelliferae) with yellow flowers. and grows to a 20-45 cm height.

Capers

- 1185 Alvarruiz (A), Rodrigo (M), Miquel (J), Giner (V), Feria (A) and Vila (R). Influence of brining and packing conditions on product quality of capers. *Journal of Food Science* 55(1); 1990; 196-198, 227

The effects of brine concn. (5.7.10.15 and 20% NaCl) on pretreatment of capers to improve preservation and packing conditions (3-10% salt, 0-15% acetic acid and pasteurization) on product stability were studied. All brines containing 10% salt and higher proved equally adequate for the preservation of capers at least for 27 months. The finished products manufactured from stock held in such brines had typical texture flavour and colour. The use of lower concn. brines led to off-flavour development and softening of the product. Pasteurization (80 °C 15min) of the finished product proved efficient for preventing spoilage. Non pasteurized samples required high salt (Ca 6%) and acid (Ca 1%) levels for preservation. Otherwise, a yellow sediment developed as a consequence of microbial growth. AS

Chillies

- 1186 Daeschel (MA), Fleming (HP) and Pharr (DM). Acidification of brined cherry peppers. *Journal of Food Science* 55(1); 1990; 186-192

Rates and routes of acetic acid penetration into non-heated cherry peppers (*Capsicum annum*) were determined by monitoring pH over time at ten interior areas. The pH was determined for fresh red and green pepper, brined peppers, and brined peppers that had been exposed to oxygen prior to brining. The pH measurements, scanning electron microscopy, and dye penetration observations indicated that the primary avenue for acid penetration was through the stem into the placenta. The last area to become acidified (pH < 4.6) was the interior of the fruit wall. Peppers that had been exposed to oxygen were more rapidly acidified (24 h) as compared to those not exposed to oxygen (150 h). AS

- 1187 Malchev (E), Ghenov (NS), Ioncheva (NI), Tanchev (SS) and Kalpakchieva (KK). Identification and changes in the higher fatty acids of dried red pepper and red pepper powder. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(3); 1989; 229-231

The higher fatty acids of dried red pepper of the var. of "Gorogled" were identified by gas chromatography with using help of authentic compounds. The following acids were established: lauric, myristic, palmitic, palmitoleic, stearic, oleic, linoleic, linolenic, arachidic and behenic acids. The results obtained from the quantitative measurements showed that linoleic, linolenic and palmitic acids amounted to 80% of the total acids. the quantitative changes of identified acids in red pepper, of dried at 60, 70, 80 and 90 C red pepper and stored as dried red pepper and red pepper powder over a 6-months period investigated. The results show that under the drying temp. applied the amount of all fatty acids decreased with an increase in the temp. During a storage a period of 3 months the amount of the respective acids decreased while the process was the most expressed in red pepper dried at a temp. of $t = 70$ C. After a 6-months storage period under the drying condition applied the dried red pepper contained a greater amount of fatty acids compared with stored for 3 months. AS

Garlic

- 1188 Bersuker (IB), Dimoglo (AS), Gorbachov (MYu), Greni (AI), Vysotskaya (LE) and Mikhailova (TV). Study of the electronic and structural properties of the chemical compounds in garlic aroma. *Die Nahrung* 33(5); 1989; 405-411

By means of the electron-topologic approach, combining the methods of the pattern recognition theory and the electron and geometric description of the mol. system under consideration, the totality of 52 sulphur-containing organic compounds is investigated. The electron-topologic activity fragment found allows to characterize correctly all the compounds of the totality and to describe successfully the influence of the structural changes in the mol. systems investigated on the garlic odour appearance. AS

SENSORY EVALUATION

- 1189 Drake (B). Sensory textural/rheological properties. A polyglot list. *Journal of Texture Studies* 20(1); 1989; 1-27

A listing is provided of 54 English terms for sensory, textural/rheological properties of foods and their equivalents in 22 other languages. Translation into the other languages was done by about 50 collaborators who had a good command of

English and their own language and who were well versed in textural/rheological terms. The original purpose of this work was to provide a new approach to developing a better understanding of textural/rheological properties and words used to describe them by utilizing the principles of linguistics. It is hoped that the publication of this list will stimulate interest in a deeper analysis. AS

- 1190 Ma (C-Y), Yiu (SH) and Harwalker (VR). Rheological and structural properties of egg white/oat globulin Co-gels. *Journal of Food Science* 55(1); 1990; 99-102, 105

CO-gels of egg white (EW) and oat globulin (native and deamidated) were prepared by heating mixtures of the two proteins at different ratios. Rheological properties of the Co-gels were assessed by small amplitude oscillatory tests. Storage (G') and loss (G'') moduli of the Co-gels increased with increase in EW content in the mixtures. At comparable EW/non-EW ratios, EW formed much stronger Co-gels with deamidated oat globulin (DOG) than with native globulin (OG) or several other non-EW proteins. Microscopic examination of mixed gels revealed structural differences between EW/OG and EW/DOG Co-gels. The former exhibited a two gel system with OG distributed discontinuously throughout the supporting EW matrix. DOG and EW formed a homogenous gel network, demonstrating compatibility between the two proteins. AS

- 1191 Rao (MA), Cooley (HJ), Walter (RH) and Downing (DL). Evaluation of texture of pectin jellies with the Voland-Stevens texture analyzer. *Journal of Texture Studies* 20(1); 1989; 87-95

Texture profile analysis (TPA) parameters were determined with a Voland-Stevens Texture Analyzer-1000 (VSTA) and an Instron Universal Testing Machine. Because of the nature of the design of VSTA, reliable magnitudes of TPA parameters based on the force-time curves recorded during the down stroke can be calculated. With a 2.54 cm diameter plexiglas plunger, the TPA parameters with the VSTA were higher than those with the Instron by 1.45% for hardness to 16.1% for fracturability. AS

FOOD STORAGE

INFESTATION CONTROL AND PESTICIDES

Insects

- 1192 Don-Pedro (KN). Mode of action of fixed oils against eggs of *Callosobruchus maculatus* (F). *Pesticide Science* 26(2); 1989; 107-115

The mode of action of groundnut and coconut oils on *Callosobruchus maculatus* eggs revealed 2 possible mechanisms of action. 1) Oils exert lethal action slowly by reducing respiratory activity and elimination of toxic metabolites as a result of the oil barrier effect and 2) direct toxic effect of oil that penetrates the eggs. Respiratory activity was measured by carbon dioxide emission for six days. In an experiment carried out by trapping *C. maculatus* eggs on oil-treated and untreated cellophane membrane it was demonstrated that oiling did not affect egg development up to the late embryonic stage but prevented hatching of most of the developed first instar larvae. Eggs that hatch on oily grain surface may find it more difficult to penetrate since egg attachments on such surfaces were found to be significantly less secure than on the control. The modes of action show that the complete spread of an oil film over the surface of a commodity is vital for the successful utilisation of fixed oils as stored-product protectants. SGB

BIOCHEMISTRY AND NUTRITION

- 1193 Ito (T), Sugawara (E), Miyahara (J-I), Sakurai (Y) and Odagiri (S). Effect of amino acids as nitrogen sources on microbiological formation of pyrazines. *Journal of Japanese Society for Food Science and Technology* (Nippon Shokuhin Kogyo Gakkaishi) 36(9); 1989; 762-764

Commercial *Bacillus natto* was cultured in the liquid media containing various amino acids, and effect of amino acids on formation of pyrazines was examined. Of all added amino acids, L-threonine promoted formation of pyrazines in the highest yields. L-Serine, the same analogous compound to L-threonine, also yielded pyrazines to the next degree. The main product of the L-threonine-culture was 2,5-dimethylpyrazine, and that of L-serine culture were tetramethyl and trimethylpyrazine. AS

- 1194 Bodwell (CE), Carpenter (KJ) and McDonough (FE). A collaborative study of methods of protein evaluation. Introductory paper. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 3-12

This paper describes the results of a cooperative study of the major chemical, microbiological and bioassay procedures for estimating the protein quality in foods. This introductory paper summarizes the results obtained with kidney beans lentils in comparison with three other animal products and two other legumes. Rat growth tests, N digestibility and amino acids viz lysine, methionine, cysteine and tryptophan analyses showed the general usefulness of in vitro digestibility procedures but at the same time problems were found to remain for the in vitro evaluation of heat damaged materials and some types of pinto beans. NGKR

- 1195 Carpenter (KJ), Steinke (FH), Catignani (GL), Swaisgood (HE), Allred (MC), MacDonald JL) and Schelstraete (M). The estimation of 'available lysine' in human foods by three chemical procedures. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 129-135

In seventeen foods analysis for available lysine by three methods was carried out and results reported in this paper. Reactive lysine was measured with either fluorodinitrobenzene, o-phthalaldehyde or a differential dyebinding and total lysine by conventional method. The results are compared with those obtained with rat growth assays for available lysine. It was seen that a sample of heat damaged milk powder gave a rat assay value corresponding to 64% of its total lysine content with other values being higher in the range of 99% for 7 animal products, 87% for 9 vegetable products. The correlation coefficient between the two set of values was 0.95 and it was not possible to predict the rat values by the reactive lysine procedures. NGKR

- 1196 Eggum (BO), Hansen (I) and Larsen (T). Protein quality and digestible energy of selected foods determined in balance trials with rats. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 13-21

This study was undertaken together further information on protein digestibility determined in vivo and in vitro biological value (BV), digestible energy and the comp. of the

seventeen different foods. Chemical analyses and nitrogen balance trials with rat showed marked differences in protein quality. Following in vitro procedure the true protein digestibility was found to be high around 90%). Similar findings were found in vivo values with the exception of beans and chick peas which were digested, to significantly lower degree when compared to the in vivo values. The reasons are found to be due to the extensive differences in the amino acid comp. of the 17 samples BV varied considerably with the lowest value of rice-wheat gluten breakfast cereal (45.5). Energy digestibility was generally high and amino acid digestibility determined in vivo followed the pattern of the corresponding protein digestibility though marked differences were found from one amino acid to another in the same food sample. NGKR

- 1197 Hawkes (JG) and Villota (R). Folates in foods. Reactivity, stability during processing and nutritional implications. *CRC Critical Reviews in Food Science and Nutrition* 28(6); 1989; 439-538

This review briefly discusses implications of folate deficiencies and to integrate the nutritional and physiological importance of folates with their chem. stability as affected by storage and/or processing variables encountered during everyday standards food preparation techniques either at home or on an industrial scale. Emphasis is placed on the importance of developing more rapid and accurate methods of analysis of individual folates for both determining biological folate status and determining kinetic rates of degradation as influenced by factors such as pH, water-activity, temp. etc. in an effort to determine conditions that would favour their retention during processing. 530 references. SRA

- 1198 Hitchins (AD), McDonough (FE) and Wells (PA). The use of *Escherichia coli* mutants to measure the bioavailability of essential amino acids in foods. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 109-120

The beta-galactosidase-based assay for lysine developed by Tuffnell & Payne was used to measure the bioavailabilities of cyst(e)ine, methionine, threonine and tryptophan in pronase digests of 17 foods. The digests were assayed by estimating the beta-galactosidase synthesis responses of five *Escherichia coli* mutants, each requiring one of the respective amino acids for protein synthesis. Deletion mutants were used whenever possible in order to ensure strain stability. Single digests

of each food were assayed with 3 or 4 separate cultures of each mutant and the results were compared with those from the corresponding chemical assay. Omitting the anomalously low values for one food, the rank correlation coeff. of the bio and chemo-assay values were 0.61 (cysteine), 0.91 (lysine), 0.95 (methionine), 0.64 (threonine) and 0.85 (tryptophan). Mean (plus or minus S.D.) relative amino acid bioavailabilities (casein = 100%) for the 17 foods were: cysteine, 53 plus or minus 23; lysine 90 plus or minus 10; methionine, 95 plus or minus 18; threonine 89 plus or minus 13; and tryptophan, 8 plus or minus 25. The cysteine mutant appeared to give usually low bioavailability values except for the milk products. These amino acid mutants afford a rapid method for assaying the bioavailabilities of at least four of the five amino acids studied. AS

- 1199 McDonough (FE), Bodwell (CE), Hitchins (AD) and Staples (RS). Bioavailability of lysine in selected foods by rat growth assay. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 67-75

Collaborative studies were carried out to determine concentrations and availabilities of lysine in 17 selected protein foods using growth of weanling rats as the index of availability and the results presented in this paper. The protein foods tested were ANRC reference casein non-fat dried milk (NDM), heat treated non-fat dried milk (NDM-H) instant whole wheat cereal, rice wheat gluten cereal, rolled oats soy protein isolate and protein conc. obtained as dried products. Tuna breakfast sausage, macaroni and cheese chickpeas, pinto beans, peanut butter and beef stew were obtained as canned products. Beef salami was obtained fresh and chicken frankfurters, frozen. A standard growth curve was obtained by feeding diets containing casein, zein and synthetic amino acids ranging in total lysine concn. from 0.3 to 0.7%. Experiment foods were added to the basal diet at the expense of zein and/or synthetic amino acids to provide the concn. i.e., 0.4 and 0.6%. It was seen that availabilities were over 8.8% or 13 of 16 products did not improve growth response indicate poor digestibility or some growth inhibitors. NGKR

- 1200 McDonough (FE), Bodwell (CE), Staples (RS) and Wells (PA). Rat bioassays for methionine availability in 16 food sources. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 77-84

In this paper methionine availability studies in

selected food source by rat bioassays have been carried out and results presented. Casein and zein in addition to crystalline amino acids are used in these studies. Nitrogen, methionine and cystine of 17 protein sources, effect of source and levels of methionine and cystine on the growth of weanling rat have been determined by standard rat bioassays. Results showed that the methionine requirement of about 550 mg per 100 g diet and cystine had a sparing effect of 50-55% to meet methionine requirements and further additions of cystine did not effect rat growth. It was also seen that methionine availabilities were excellent for 15 of the 16 test foods (88-100%) only incase of pinto beans the availability was low (58%) due to some factors other than availability. NGKR

- 1201 McDonough (FE), Dodwell (CE), Wells (PA) and Kamalu (JA). Bioavailability of tryptophan in selected foods by rat growth assay. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 85-91

Bioavailability studies on tryptophan in-selected foods by rat growth exp. for 10 day period are carried out and results presented in this paper. Growth studies or rats fed test food diets were compared to growth responses of rats fed basal diets with graded levels of tryptophan ranging from 50 to 100 mg tryptophan per 100 g diet. The tryptophan availabilities were low in whole wheat cereal (73%) and pinto beans (59%) with 85-100% in case of all other products. This indicated the presence of unidentified growth inhibitor in pinto beans resulted in its poor digestibility and lysine availability. NGKR

- 1202 Mongeau (R), Sarwar (G), Peace (RW) and Brassard (R). Relationship between dietary fiber levels and protein digestibility in selected foods as determined in rats. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 45-51

Samples of 15 food products and feces obtained by feeding them to rats were analysed for dietary fiber fractions. The food products were added as the sole source of protein in 8% protein diets, making up 8.8-51.6% of the diets. Diets were supplemented with 0.54-5.00% purified cellulose to make them more comparable in total fiber. Fiber analyses of food products revealed that the protein sources provided 0.06-7.27% total dietary fiber. The true protein digestibility in rats was negatively correlated with the total food fiber level ($r = -0.69$, $P < 0.01$) or with the food cellulose level ($r = -0.82$,

$P < 0.01$) but it was positively correlated ($r = + 0.81$, $P < 0.01$) with the purified cellulose level. No relationship was found between protein digestibility and fiber fermentability. Results indicate that several food fiber fractions and possibly associated substances influenced protein digestibility. Purified cellulose did not have the same physiological behaviour as food cellulose from the viewpoint of protein digestibility and fiber fermentability. AS

- 1203 Price (KR), Lewis (J), Wyatt (GM) and Fenwick (GR). Flatulence - causes, relation to diet and remedies. *Die Nahrung* 32(6); 1988; 609-626

In addition to causing embarrassment and unease, flatulence is linked to a var. of symptoms, some of which may be distressing. This review describes the origins of intestinal gas, its comp. and methods which have been developed for its analysis. Emphasis is placed upon the effects of legumes in the diet in producing excessive intestinal gas and, particularly, on the role of raffinose-type oligosaccharides, containing alpha-galactosidic groupings. Suggestions for overcoming the problem are presented, including drug treatment, enzyme treatment, food processing and plant breeding. It is emphasised that removal of all raffinose-oligosaccharides from beans does not remove the problem of flatulence in animals and man; the compounds responsible-though assumed to be polysaccharides (or polysaccharide-derived oligomers formed by processing or cooking)-have yet to be characterised. AS

- 1204 Sarwar (G), Peace (RW), Botting (HG) and Brule (D). Digestibility of protein and amino acids in selected foods as determined by a rat balance method. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 23-32

In this paper the data on the digestibility of crude protein and amino acids in twenty selected foods and protein quality as judged by PER, NPR, RPER and RNPR has been presented. The detn. was carried out by rat balance (fecal method). The products were fed as the sole source of protein in diets containing 8% crude protein ($N \times 6.25$). Results show lower protein digestibility values (79-84) for pinto beans kidney beans and lentils, intermediate values (89-92) for chick peas, beef stew skim milk (over heated), rolled oats whole wheat cereal, and pea protein concn. and highest values (94-100) for sausage, macaroni-cheese, rice wheat gluten cereal skim milk, tuna-soy isolate, peanut butter chicken frankfurters, beef salami casein and casein + methionine. Increase of animal

foods, peanut butter and soy isolate the differences between true digestibility of crude protein and most individual amino acids were less than 5%. The values for true digestibility of methionine and cysteine were upto 44% lower than those of crude protein in pinto beans, kidney beans lentils chickens and pea conc., showing there by that protein digestibility is not a good predictor. NGKR

- 1205 Sarwar (G), Peace (RW), Botting (HG) and Brule (D). Relationship between amino acid scores and protein quality indices based on rat growth. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 33-44

Protein efficiency ratio (PER), relative PER (RPER), net protein ratio (NPR) and relative NPR (RNPR) values, and amino acid scores were calculated for 20 food products (casein, casein + Met, beef salami, skim milk, tuna, chicken frankfurters, sausage, heated skim milk, peanut butter, rolled oats, soy isolate, chick peas, pea conc., kidney beans wheat cereal, pinto bean, lentils, rice-wheat gluten cereal, macaroni-cheese, and beef stew). In most cases, PER, RPER, NPR or RNPR ranked the products in the same order and positive correlations among the protein quality method were highly significant ($r = 0.98 - 0.99$). Amino acid scores (based on the first limiting amino acids, Lys-Met-Cys. Lys-Met-Cys-Trp or lys-Met-Cys-Trp-Thr) were positively correlated to the per PER, RPER, NPR, or RNPR data ($r = 0.61-0.75$). Inclusion of the correction for true digestibility of protein improved the correlations between amino acid scores and the indices based on rat growth. The correlations were especially high between Lys-Met-Cys scores (corrected for true digestibility of protein) and PER, RPER, NPR, or RNPR ($r = 0.86-0.91$). Inclusion of the correction for true digestibility of individual amino acids did not result in further improvements of the correlations in most cases. It is concluded that adjusting amino acid scores for true digestibility of protein would be sufficient and further correction for digestibility of amino acids would be unnecessary in mixed diets. AS

- 1206 Savoie (L), Charbonneau (R) and Parent (G). In vitro amino acid digestibility of food proteins as measured by the digestion cell technique. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 93-107

The digestibility of proteins and individual amino acids of nineteen selected foods was determined by an in vitro assay. Samples were hydrolysed with pepsin for 30 min. in an

acidic medium; the pH was then raised to 7.5 and the mixture poured into the dialysis bag (mol. wt. cut-off 1000) of a digestion cell with pancreatin. Digestion products, mixtures of free amino acids and low mol. wt. peptides which pass through the dialysis membrane, were collected for 6 h by sodium phosphate buffer circulation. All proteins from animal sources displayed a digestibility similar to casein, except for cereals (lower) or peanut butter (higher). Target amino acids of enzymes were generally more readily hydrolysed. However, compared to other animal proteins, glycine in milk products, valine, isoleucine, methionine and lysine in breakfast sausage and hot dog, and histidine in tuna were more easily released. Overheating of non-fat dried milk not only reduced the lysine digestibility, but also that of methionine, phenylalanine, histidine and cystine. Among vegetable proteins, wheat products were characterized by a relatively greater release of threonine, isoleucine and histidine, and peas by a lower digestibility of methionine and lysine. Proline of soy isolate and isoleucine of pinto bean were resistant to hydrolysis while arginine of pinto beans and rice-wheat gluten was easily released. AS

- 1207 Silwar (R) and Tressl (R). Gas chromatographic-mass spectrometric investigation of aroma compounds from the reaction of cysteine and methionine with furfural under roasting conditions. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(3); 1989; 205-211 (De).

The model-system cysteine/methionine/furfural produced under roasting conditions a complex mixture of compounds which was separated by adsorption chromatography on silica gel, according to the increasing polarity of the components, into six fractions. The fractions were investigated by capillary gas chromatography with and without mass spectrometry. Of the approx. 130 compounds detected, 85 were identified and quantified. Furfural and the reactive degradation products hydrogen sulphite, cysteamine and methylmercaptan, resulting from cysteine and methionine, are important precursors for heterocyclic flavour components. Besides furans (furan)aldimines, and sulphur-substituted furan derivatives, the following compounds are also formed: N-furfurylpyrroles, pyridines, thiazoles, thiazolines, thiazolidines, thiophenes, as well as aliphatic sulphur compounds and cyclic methylene polysulphides. During coffee roasting, furfural is produced as one of the major components of the furans and is essential for the formation of important coffee aroma constituents. AS

- 1208 Thresher (WC), Swaisgood (HE) and Catignani (GL). Digestibilities of the protein in various foods as determined in vitro by an immobilized digestive enzyme assay (IDEA). *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 59-65

In this paper the digestibility of protein in various foods or food components was analysed using an IDEA system and the results are presented. This assay consists of two bioreactors, one containing pepsin and the other containing trypsin, chymotrypsin and intestinal mucosa peptidases. The fraction of the peptide bonds hydrolysed during an extent of hydrolysis assay was correlated with independent in vivo detn. of the digestibilities. A correlation coeff. of 0.80 was recorded and this linear regression equation can be used to predict digestibility and this method is found to be sensitive to structural modification of protein as caused by heat treatment. NGKR

- 1209 Wells (P), McDonough (F), Bodwell (CE) and Hitchins (A). The use of *Streptococcus zymogenes* for estimating tryptophan and methionine bioavailability in 17 foods. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(1); 1989; 121-127

Collaborative studies on comparison of various methods of determining amino acid availability and protein quality of 17 commercial food products of both vegetable and animal origin are carried out using *S. zymogenes* for the availability of tryptophan and methionine. Microbial assays of tryptophan and methionine availabilities were compared to those with rat growth assays on the same foods using pronase as the predigesting enzyme. It was seen that product comp. was found to affect reproductibility and the microbial assay results compared positively with results obtained with rat growth method. Methods of processing such as heating and grinding were found to affect the values. Defatting also increased the microbial values in the case of high-fat products during methionine assay. NGKR

Nutrition

- 1210 Greger (JL). Effect of dietary protein and minerals on calcium and zinc utilization. *CRC Critical Reviews in Food Science and Nutrition* 28(3); 1989; 249-264

This review covers methodology for assesment of nutrient interactions (in vitro analysis, detn. of excretion patterns

of nutrients or metabolites, assessment of nutritional status in animals or subjects, functional tests), interactions of dietary protein with Ca and Zn (effect of isolated protein Ca metabolism, effect of isolated protein on Zn metabolism), interactions of dietary P with Ca and Zn (effect of levels of P on Ca metabolism, inorganic phosphates, 2. phytate, effect of the level of P on Zn metabolism), interactions of electrolytes with Ca interaction among minerals that affect Ca and Zn utilisation (effect of variations in dietary Ca, effects of variations in dietary Mg, effect of variations in dietary levels of trace elements. 1. Zn, 2. Fe, 3. Tin), diet milieu and recommendations for research. 184 references. SRA

- 1211 Obizoba (IC). The nutritive value of mixtures of two varieties of Bambarra groundnut and sorghum. *Cereal Chemistry* 66(4); 1989; 249-251

Thirty albino rats were used to investigate the nutritive value of mixtures of two bambarra groundnut var. (cream and brown) with sorghum. The bambarra groundnuts were dehulled and soaked and mixed in a 70:30 ratio with sorghum soaked for 18 or 24 h. The 12-day balance study consisted of a five-day adjustment and seven-day N and mineral balance period. The four all-vegetable mixed test diets and casein, which served as the control, provided 1.6 g of N per 100 g diet daily during the study. Casein caused decrease in food and N intakes, wt. gain, and dietary and retained P and increased other parameters tested. Dehulling improved the nutritive value of the cream var. better than the brown except for dietary and retained Fe. Soaking improved the nutritive value of the brown var. much more than the cream. The results of this study indicate that blends of bambarra groundnut and sorghum could provide cheap and nutritious dishes for the populations that use them as staple foods. AS

TOXICOLOGY

Nil

FOOD LAWS AND REGULATIONS

- 1212 Cafta. Food labelling. *Food Technology in Australia* 41(9); 1989; 930-931

This document describes the requirements of the National health and Medical Research Council (NHMRC) food standards code. Article gives some details in application and adoption of this code which may vary from state to state. Some examples like statements or words that must appear, statements or words which must not appear, statements or words that may appear under certain circumstances. SRA

ANNOTATED BIBLIOGRAPHIES

1. Aseptic Packaging(1983-85)
2. Beet Molassses(1959-1988)
3. Cassava(1977-1986)
4. Cassava Starch(1976-1986)
5. Cocoa Flavour and Aroma
6. Cultured Milk(1977-1986)
7. Energy Conservation in Food and Allied Industries (14 Parts)
8. Ethanol Production(1976-1986)
9. Extruded Food and Machinery(1968-1986) 4 volumes
10. Food Grains (Publications of CFTRI and DFRL, Mysore)
11. Fumaric acid(1969-1988)
12. Indian Sweets(1969-1987)
13. Instant Noodles(1970-1985)
14. Khoa(1969-1987)
15. Lemon Juice(1978-1987)
16. Lemon Oils(1978-1987)
17. Lemon Pectin(1978-1987)
18. Papad(1969-1987)
19. Pomegranate(1969-1987)
20. Potato Starch(1977-1986)
21. Rice and Wheat Quality (World Literature) 1987
(Rice Quality 1969-1986; Wheat Quality 1975-1986)
22. Rice Bran and Rice Bran Oils (1970-1980)(1983)
23. Soy Sterols(1969-1988)
24. Tamarind Gums(1969-1987)
25. UHT-Milk(Spoilage)(1975-1988)

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GENERAL

- 1213 Arthey (D). Acceptable food for the future. Meeting consumer demand. *British Food Journal* 91(9); 1989; 18-21

The consumer demands which food manufacturers must meet are addressed. Acceptability, need of the consumer (safety, quality, nutrition and health, convenience foods of the future) are the aspects discussed. SRA

- 1214 Farkas (J). Microbiological safety of irradiated foods. *International Journal of Food Microbiology* 9(1); 1989; 1-15

This paper attempts to summarize relevant information on microbiological safety of irradiated foods in the light of previous reports of expert committees and current literature references. After a brief survey of the relative radiation resistance of food-borne microorganisms, the importance of microbial load for dose requirement, and role of post-irradiation conditions, it addresses the following questions: Could selective changes in the microflora, caused by non-sterilizing radiation doses, make known pathogens more likely to occur, or bring into prominence unfamiliar pathogens? Is it probable that mutational (including adaptive) changes might make pathogenes more virulent, more harmful, more difficult to recognize, and could new pathogens arise in this way? it is possible that development of radiation-resistant strains might render the antimicrobial irradiation processes ineffective? The present survey of relevant scientific evidence related to these questions reaffirms the basic conclusion of earlier reviews, that microbiological safety of irradiated foods is fully comparable with that of food preserved by other acceptable preservation methods. Similar to other preservation processes, gains in microbiological or keeping quality attained by food irradiation can be and must be safeguarded by proper control in the food irradiation facilities and by proper care of the product before and after processing. AS

- 1215 Malseed (J). Food poverty-the end of the live? *British Food Journal* 91(9); 1989; 22-25

- 1216 Wheelock (V). Food safety in perspective. *British Food Journal* 91(8); 1989; 31-36

Recommendations are made for the achievement of genuine improvements in food safety. Current issues (foodborne disease, malnutrition, other aspects) and priorities for action (research and education) are disscussed. SRA

FOOD PROCESSING

Nil

FOOD PACKAGING

Packaging

- 1217 Anon. Aromatic film. Possibility of evaluation for application into food field. **Packaging Japan** 9(44); 1988; 48-53

This study reports manufacturing method of aromatic film (coating method, direct mixing method, resin combination method), kind and characteristic of Nisseki aromatic film (manufacturing process, Aromatic film, aromatic paper, barrier type, peel-off type), way of use and application of Nisseki aromatic film (scent sample of perfumed product, advertising media, product with added value, scent culture), aromatic film and food package (motivation for purchase, feeling of satisfaction after purchase, discernment of content, mycostic effect, specifications and points to be noted of aromatic film). SRA

- 1218 Ishitan (T). Trends of food packaging and related technologies viewed from quality preservation of food. **Packaging Japan** 9(44); 1988; 37-45

This article highlights trends in food preservation, preservation and distribution techniques for packaged, prevention of deterioration changing from chemical method to physical technique, kind of electromagnetic wave and application for pasteurization, combined technique of physical and chemical method, aroma preservation of packaged foods, and quality preservation and packaging of fruits and vegetables. SRA

- 1219 Sharma (BM). Packaging industry in India. **Packaging India** 21(3); 1988; 5-12

Packaging materials

Plastics

- 1220 Subramanian (MR). Role of plastics in packaging of food products. **Packaging India** 21(3); 1989; 18-20

FOOD ENGINEERING AND EQUIPMENT

Engineering

- 1221 Awonorin (SO). A model for heat transfer in cryogenic food freezing. *International Journal of Food Science and Technology* 24(3); 1989; 243-259

An experimental study of the heat transfer liquid nitrogen sprays and a model food (a gelatine slab) was carried out under conditions similar to those in a cryogenic freezer. Measurements of heat flux and local mass flow rates of the spray were made at various liquid nitrogen pressures and various temp. differences between the spray and the food surface. At higher spray pressures, the heat transfer coeff. increases with the mass flux density of the liquid available at the food surface. The quantity of liquid nitrogen sprayed onto the solid surface, the mean droplet size, spray velocity, surface coverage and the mean temp. differences between the boiling nitrogen and the food surface are major factors influencing the rate of heat transfer during the freezing process. Although the heat transfer coefficients at the food surface are much less than those obtained for individual droplets, the model provides useful data. AS

- 1222 Balaban (M). Effect of volume change in foods on the temperature and moisture content predictions of simultaneous heat and moisture transfer models. *Journal of Food Process Engineering* 12(1); 1990; 67-88

Temp. and moisture content predictions of two models of simultaneous heat and moisture transfer (SHMT) in foods with and without the assumption of vol. change were compared. In the first model, thermophysical and transport parameters were kept constant. In the second model, these were taken as variable functions of temp. and moisture content. Comparison of the results of both models with and without shrinkage assumption showed that there can be significant differences in predicted moisture and temp. gradients, and average moisture contents and temp. Biot numbers for heat and mass transfer, and the extent of overall shrinkage with moisture loss are important factors affecting these differences. The predictions of the second model were compared to experimental drying data with shrinkage. The variable-grid finite difference method can be used successfully to solve model equations involving vol. changes. AS

- 1223 Fikiin (KA) and Fikiin (AG). Numerical model for cooling food materials and other solid bodies of varied geometric shape. *International Journal of Refrigeration* 12(4); 1989; 224-231

(Fr).

By means of a finite differences scheme, a generalized numerical model has been developed, allowing the detn. of the temp. field and the duration of the non-stationary process of cooling solid bodies (food materials) under boundary conditions of the third order. The general solution obtained refers to varied and complicated shapes, both regular one and multidimensional, and irregular stereometric shapes, reflecting the real configuration of food materials. This makes it universal as regards the geometry of the bodies. In terms of calculation, the model is realized with the aim to computerize engineering investigations. A program product has been created on the basis of the suggested organization of the computing process. AS

- 1224 Salvadori (VO) and Mascheroni (RH). Thawing time prediction for simple shaped foods using a generalized graphical method. *International Journal of Refrigeration* 12(4); 1989; 232-236

A graphical method is proposed for the estimation of thawing times of foods with a high water content. It has been developed from the predictions of a numerical model which solves the heat balance for a food undergoing thawing. The method is valid for foods with different shapes (slab, cylinder and sphere) and covers a wide range of working conditions for industrial thawers. It also enables the prediction to be made for any given end temp. in the thermal centre of the food. Thawing times predicted by this method have been compared with published experimental data, giving an average error in the predicted values of only 6.5%. AS

Drying

Spray drying

- 1225 Donhowe DP, Amundson (CH) and Hill (CGJr). Performance of heat recovery system for a spray dryer. *Journal of Food Process Engineering* 12(1); 1990; 13-32

A factorial experimental design was used to study the effect of exhaust heat recovery, air flow rate and outlet temp. on the energy consumption of a spray dryer. A commercial-scale cocurrent flow dryer with pressure atomization was used to dry 15 wt% sodium sulphate solutions. The inlet air to the dryer was preheated by using a shell-and-tube heat exchanger to recover energy from the exhaust air. Heat recovery reduced the energy consumption of the dryer by 12-28%, with the largest reduction occurring at the high levels of air flow rate (13,000 kg/h) and outlet temp. (104 C). The energy consumption of the dryer was lowest when heat was recovered at the low air flow

rate (6500 kg/h) and low outlet temp. (82 C). No problems were encountered with fouling or cleaning of the heat exchanger. The total pressure drop across the heat exchanger varied from 0.05-0.2 kPa depending on the air flow rate. This additional flow restriction resulted in an estimated 8% decrease in air flow rate but had negligible effect on energy consumption. The warm-up time and the space required by the heat recovery unit were insignificant factors for this dryer. The payback period of the heat recovery system was estimated as 4.1-5.4 yrs with a rate of return of 21-28%. AS

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry (Analytical)

- 1226 Castineira (M). Pulsed NMR uses in food industries. I. Theoretical principles. *Revista de Agroquimica Y Tecnologia de Alimentos* 29(3); 1989; 315-331 (Es).

Pulsed NMR principles are briefly reviewed and related techniques compared with brief description of the methods for measuring relaxation times and the free induction decay (FID). 13 references. BV

- 1227 Koitada (Y), Tamose (K), Sasaki (M) and Yamazoe (Y). Determination of L-ascorbic acid and erythorbic acid in foods by high performance liquid chromatograph with amperometric detection. *Journal of Japanese Society for Food Science and Technology* (Nippon Shokuhin Kogyo Gakkaishi) 36(7); 1989; 592-596
- 1228 Osajima (Y). Recent analysis in food analysis. *Journal of Japanese Society for Food Science and Technology* (Nippon Shokuhin Kogyo Gakkaishi) 36(7); 1989; 609-614
- 1229 Toukairin-Oda (T), Sakamoto (E), Hirose (N), Mori (M), Itoh (T) and Tsuge (H). Determination of vitamin B6 derivatives in foods and biological materials by reversed-phase HPLC. *Journal of Nutritional Science and Vitaminology* 35(3); 1989; 171-180

Through use of a simplified analyzing system, seven vitamin B6 derivatives were determined with a satisfactory

sensitivity and precision. This system consisted of single reversed-phase ODS column with a fluorescence detector employing an isocratic solvent system. Each vitamin B6 derivative in some foods and biological materials was determined, based on the measurement of the integrated peak area. The data obtained by this method were compared with those obtained from a bioassay by *Saccharomyces uvarum* ATCC 9080, after acid hydrolysis of these materials. AS

- 1230 Yamagishi (T), Akiyama (H), Kimura (S) and Toyoda (M). Quantitative determination of phosphatidylcholine by HPLC-RI system. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1801-1808

The paper describes the quantitative determining method for phosphatidylcholine (PC) using the HPLC-RI system which has been developed. It uses Lichrosorb, Si 60 (10 μ m), 4.6 mm x 250 mm as the column and a mobile phase consisting of n-hexane/isopropanol/water 1:4:1. In this report, the data from selected high purity (60-100 wt%) samples using the HPLC-RI, HPLC-UV and conventional TLC-P methods compared. Under the conditions described, the HPLC-UV method was somewhat affected by fatty acid comp. As a result, there were some inconsistencies in the measured values. However, the HPLC-RI method proposed was applicable to PC from both egg yolk and soybeans. In addition, the HPLC-RI method produced data which correlated well with data from the TLC-P method, and this data was highly accurate and exhibited satisfactory reproducibility. AS

FOOD MICROBIOLOGY AND HYGIENE

Ethyl alcohol

- 1231 Tabera (J) and Iznola (MA). Design of a response function to optimize a continuous ethanol fermentation. *Revista de Agroquímica Y Tecnología de Alimentos* 29(3); 1989; 368-37 (Es).

The design of a response function, based on economic data, to optimize a continuous ethanol fermentation process with cell recycle is reported. By using this response and the simplex method an optimal 49.23% ethanol-substrate yield (91.5% of the stoichiometric yield), 9.17g/Lh ethanol productivity and 56.61g/L concn. of ethanol were obtained. AS

Fermentation

- 1232 Ardhana (MM) and Fleet (GH). The microbial ecology of ta

kietan fermentation. *International Journal of Food Microbiology* 9(3); 1989; 157-165

The growth of fungi, yeasts and bacteria was followed during the fermentation of tape ketan. The tape was prepared using samples of Indonesian ragi as inoculum. Fermentation was characterized by the dominant growth of *Amylomyces rouxii* and *Candida pelliculosa* $10^5 - 10^7$ cfu/g and a lesser contribution from *Saccharomyces cerevisiae*, *Hansenula anomala* grew to a limited extent during some fermentation. Bacteria of the genera *Bacillus* and *Acetobacter* contributed also to the fermentation, producing populations up to 10^5 cfu/g. Ragi was the main source of microorganisms involved in the fermentation. Tape fermented by inoculating pure cultures of *Amylomyces rouxii* and the yeasts, either individually or as mixtures, was not of typical quality, indicating the importance of bacteria in the overall fermentation.

Microorganisms

- 1233 Moseley (BEB). Microbiological safety. The role of the institute of food research. *British Food Journal* 91(8); 1989; 37-39

Scientific research relevant to food safety is described. Aspects covered are forward surveillance of food chain, predictive modelling of microbial activity, development of new methods for bacterial detection, competitive exclusion and irradiation of food. SRA

Bacteria

- 1234 Ligugnana (R), Rovere (E) and Schalkowsky (S). The spiral plating system for bacterial enumeration. *Industrie Alimentari* 28(274); 1989; 821-823 (It).

Aeromonas

- 1235 Knchel (S). Effect of temperature on haemolysin production in *Aeromonas* spp. isolated from warm and cold environments. *International Journal of Food Microbiology* 9(3); 1989; 225-235

The effect of growth temp. on the hemolysin production in 97 *Aeromonas* isolates was studied only 9% of the isolates obtained from low-temp. sources such as refrigerated foods, drinking water and trout aquaculture were able to produce high hemolysin titer (Titer 128) at 37 C compared with 65% of the isolates from warm sources such as human clinical cases and warm water temp. ($P < 0.001$). In contrast, 61% of the lowest

temp. isolates were producing high hemolysin titers at 10 C while only 24% of the isolates from high temp. sources produced high Titters at this temp. ($P < 0.05$). Hemolytic activity could decrease markedly during longer (48 h) incubation at 37 C. Some of the filtrates from growth at 37 C and 10 C were tested for enterotoxin-like activity in the suckling mice test. Of the culture filtrates produced at 37 C, 40% of *A. hydrophila* were positive for enterotoxin-like activity, irrespective of hemolysin titer. of *A. sobria* 88% of the filtrates with high hemolysin titers and none of the low-titer filtrates were enterotoxigenic. Due to a high mortality rate of mice injected with filtrates produced at 10 C the enterotoxic effect of these filtrates could not be established. Autoagglutination after boiling was observed in 31% of the clinical isolates and 2% of the strains of environmental origin. AS

Clostridium perfringens

- 1236 Mehta (R), Narayan (KG) and Notermans (S). DOT-enzyme linked immunosorbent assay for detection of *Clostridium perfringens* type A enterotoxin. *International Journal of Food Microbiology* 9(1); 1989; 45-50

A procedure, which have been termed as DOT-ELISA, to detect *Clostridium perfringens* type A enterotoxin, on nitrocellulose paper is described. Seventy eight preparations from 39 cultures of *C. perfringens* type A were tested simultaneously by this and by Plate-ELISA methods. The results were comparable. DOT-ELISA detected as little as 0.02 μg of purified enterotoxin and 0.13 μg of enterotoxin in cell-free culture supernatant. As little as 0.02 μg purified enterotoxin mixed with human faeces could be detected specifically. The method is simple and does not require an ELISA reader. AS

Escherichia coli

- 1237 Ottaviani (F). Evaluation of the 3M petrifilm (*E. coli*) culture plate method for the rapid identification of *Escherichia coli* in food. *Industrie Alimentari* 28(274); 1989; 806-810

A commercial (Petrifilm *E. coli* 3 M), test for the rapid and specific enumeration of *Escherichia coli* was evaluated for monitoring specific colonization of minced meat (21 samples) and soft cheese (43 samples). Multiple tests were performed by using the standard MPN multiple test were performed techniques ISO 7251 and ISO 3811, the Brilliant Green Bile 2% Broth and Lauryl Tryptose Broth supplemented with the μG fluorogenic substrate and the Petrifilm *E. coli* method. A good agreement was seen between all the methods when testing minced meat samples. Nevertheless, in samples where bacterial cells were

sublethally stressed as in cheese, a different in efficiency of recovery of the bacteria was noted. With Brilliant Green Bile Broth incubated at elevated temp. *E. coli* count was lower than any other method, including Brilliant Green Bile Broth with fluorochrome incubated at 37 C. The petriflim *E. coli* procedure permits a rapid, easy and precise enumeration of *E. coli* in samples, as raw meat and soft cheese, whereas too low sensitivity less than 10 cells per unit is not required. AS

Lactobacillus acidophilus

- 1238 Raccach (M), McGrath (R) and Daftarian (H). Antibiosis of some lactic acid bacteria including *Lactobacillus acidophilus* toward *Listeria monocytogenes*. *International Journal of Food Microbiology* 9(1); 1989; 25-32

Eleven strains lactic acid bacteria were tested by the 'spot' on the 'lawn' method for their antagonistic activity against four strains of *Listeria monocytogenes*. Four out of the five strains of lactic acid bacteria most antagonistic toward the pathogen were those cultures known to produce bacteriocins. Four other strains of lactic acid bacteria were not antagonistic against *Listeria* by this method. Seventeen inhibition zones of the pathogen were obtained at 25 C as compared to 10 at 32 C. *Lactobacillus acidophilus* strains NU-A and 88, growing in the presence of *L. monocytogenes* in milk prevented the latter from attaining populations it would have in pure culture ($P < 0.001$). $10^{1.4}$ - $10^{3.5}$ lower numbers were noted. *L. acidophilus* in most cases exhibited a bacteriostatic effect toward the pathogen except for strain 88 which appeared to have a bactericidal effect ($P < 0.01$) against *Listeria* strain OH. The lactobacilli reduced the pH of the milk to 4.7 over a 24 h period, showing that acid played a role in the observed antibiosis. AS

Pseudomonas fluorescens

- 1239 Mitchell (SL) and Marshall (RT). Properties of heat stable proteases of *Pseudomonas fluorescens*. Characterization and hydrolysis of milk proteins. *Journal of Dairy Science* 72(4); 1989; 864-874

Extracellular proteases from strains P26, 32A, PI, P27 of *Pseudomonas fluorescens* were produced using a dialysis membrane method. The proteases were partially purified by gel filtration (mol. wt. cutoff- 60,000) and selected biochemical characteristics were determined. Proteases of all strains were heat-stable (62.5 C, 30 min), neutral (>84% of total activity between pH 6 and 8) metalloenzymes (inhibited by 10 mM EDTA). Optimal temp. for activity was about 37 C, but all proteases were active at 5 C. Activation energies on azocasein ranged

from 4.5 (P1) to 14.0 (32A) kcal/mol⁻¹. All extracellular proteases had strong endopeptidase activity, but no exopeptidase (aminopeptidase) activity was detected. Proteolytic activity on purified milk proteins was measured using an o-phthal-dialdehyde assay. Specific activities of the pseudomonal proteases on casein proteins were significantly higher ($P < 0.1$) than on whey proteins. Hydrolysis of whole casein by proteases of strains P26, 32A, and P27 was significantly greater than on alpha-, beta-, or kappa-casein, whereas protease of strain P1 hydrolyzed whole casein and alpha-casein at equal rates. Proteases varied in abilities to hydrolyze alpha-, beta- and kappa-casein; bovine serum albumin, beta--lactoglobulin, and alpha-lactalbumin were weakly hydrolyzed. AS

- 1240 Mitchell (SL) and Marshall (RT). Specificity of heat-stable pseudomonal proteases. Peptide mapping by reverse-phase high performance liquid chromatography. *Journal of Dairy Science* 72(4); 1989; 875-882

Extracellular heat-stable proteases from strains P26, 32A, P1, and 27 of *Pseudomonas fluorescens* were partially purified by mol. exclusion chromatography. Peptides generated from the hydrolysis of oxidized ribonuclease A by proteases of known substrate specificity (trypsin, chymotrypsin, *Staphylococcus aureus* protease) and the pseudomonal proteases were separated by reverse-phase HPLC. The proteases of known specificity generated a low number of peptides in relatively high concn. Proteases of strains P26, 32A, P1 and P27 produced more peptides, and most of these peptides were in low concn. Thus, the pseudomonal proteases exhibited a comparatively wide substrate specificity. Among the heat-stable proteases, those of strains P26 and 32A hydrolyzed a wider range of peptide bonds than did proteases of strains P1 and P27. AS

Staphylococcus

- 1241 Schwabe (M), Notermans (S), Boot (R), Tatini (SR) and Kramer (J). Inactivation of staphylococcal enterotoxins by heat and reactivation by high pH treatment. *International Journal of Food Microbiology* 10(1); 1990; 33-42

Inactivation of *Staphylococcus* enterotoxins (SE) added to different media upon heat treatment (80 C or 100 C for 10 min) and reactivation of inactivated SE was studied. In gelatin (pH 4.0) lettuce extract, peas and beans extracts and ovalbumin (pH 5.0) the immunological activity of SE was lost almost completely upon heating. The loss of immunological activity of SEA was accompanied by a concomitant loss of biological activity of this toxin (monkey feeding test). A high pH treatment (pH 11) of the different preparations restored both

the immunological and biological activity in most samples tested. Heating at 80 C or 100 C for 10 min of SE containing gelatin (pH 7.0), cauliflower extract (pH 4.0 or pH 7.0), milk (pH 4.0), casein (pH 6.0), rice extract (pH 7.0), noodles extract (pH 4.0) and oat-flakes extract (pH 7.0) had a much lower effect on the immunological activity of the SE (activity greater than or equal to 25%). AS

Fungi

Yeasts

- 1242 Simson (WJ) and Manmonel (JRM). The response of brewing yeast to acid washing. *Journal of the Institute of Brewing* 95(5); 1989; 347-354

Brewing yeasts are inherently resistant to acid washing treatments but, under some conditions this resistance is diminished. Sixteen yeast strains, including both ale and lager strains, have been successfully washed using phosphoric acid (pH 2.1) and, in some cases, sulphuric acid (pH 2.0) or acidified 0.75% W/V ammonium persulphate (pH 2.8). Cell viability, fermentation performance and flocculation/fining behaviour were unaffected. However, changes could be observed in the yeast resulting from the washing treatment. These included alterations of the cell surface, as shown by scanning electron microscopy and leakage of adenosine triphosphate from the cells during the wash. Acid washing is successful provided that, i) food grade acid is used, ii) the acid is chilled before use, iii) the yeast and acid are well mixed, iv) the temp. of the yeast does not exceed 5 C. during washing and, v) the yeast is pitched immediately after washing. 'Unhealthy' yeast (yeast which has been stored for long periods, heavily contaminated yeast, or yeast from slow fermentations) may respond poorly to acid washing and a shorter washing time, or higher wash pH value should be employed. AS

BIOTECHNOLOGY

- 1243 Kubota (M), Koyano (T), Shinohara (K) and Nashinari (K). Rheological properties of spirulinan. *Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)* 36(7); 1989; 569-577 (Ja).

Rheological properties of spirulinan, a mucilaginous

polysaccharide extracted from *Spirulina subsalsa* Oerst var. Crassior, were observed together with other food hydrocolloids, Lambda carrageenan, locust bean gum, guar gum, xanthan and pullulan. The viscoelastic coeff. of spirulinan did not depend so much on temp. compared with other food hydrocolloids. Spirulinan was found to have gelling ability in the presence of salts, such as KCl, NaCl, CaCl and MgCl spirulinan gel showed excellent water holding capacity. AS

- 1244 Schreier (P). Aspects of biotechnological production of food flavours. *Food Reviews International* 5(3); 1989; 289-315

This article highlights the three principle technologies (plant tissues and cell culture, use of microorganisms and use of enzymes) and their application for bioflavour production. Covers biotechnology, plant tissues and cell culture, microbial and enzymic methods, fermentations, microbial transformations and enzymes. 111 references. SRA

TISSUE CULTURE

Nil

FOOD ADDITIVES

Acidulants

- 1245 Dziuezak (JD). Acidulants. Ingredients that do more than meet the acid test. *Food Technology* 44(1); 1990; 76-83

Flavour enhancement, preservation, buffering and leavening are just a few of the many diverse roles acidulants have in food. This report describes nine commonly used acidulants, detailing their functions and applications. AS

Flavourings

- 1246 Chi-Tang Ho, Yuangang Zhang, Huang Shi and Jian Tang. Flavour chemistry of Chinese foods. *Food Reviews International* 5(3); 1989; 253-287

In this review the flavour chemistry of seasonings and spices (soy sauce, vinegar, garlic, scallions, shallots, ginger, staranise, and black mushroom) has been summarised. Discusses the possible interactions of seasonings on spices with other ingredients in cooking of Chinese dishes, and present selected examples of flavours of traditional Chinese

foods. 58 references. SRA

- 1247 Tyrrell (MH). Evaluation of natural flavour development with the assistance of modern technologies. *Food Technology* 44(1); 1990; 68-72

A historical account of aromatic substance from nature sources with processing, distillations, solvent extraction, rectification, and aroma blends, have been dealt. Though historically flavour compounds were primitive but met with the need of foodstuffs developed at that time. The increased availability of natural components is enabling the creation of functional flavours with excellent efficacy at a quickening pace and will only be limited by commercial needs and possible regulatory restrictions. GAR

Preservatives

Potassium sorbate

- 1248 Vojdani (F) and Torres (JA). Potassium sorbate permeability of polysaccharide films. Chitosan, methylcellulose and hydroxypropyl methylcellulose. *Journal of Food Process Engineering* 12(1); 1990; 33-48

Edible coatings controlling preservative migration from surface to food bulk could control surface microbial growth which is often the main cause of spoilage for many food products. In this paper the potassium sorbate permeability, behaviour of chitosan, methyl cellulose and hydroxypropyl methyl cellulose based films is examined. To gain an understanding of the permeation process, permeability detn. were done at 5, 24, 32 and 40 C. Permeability rates followed the Arrhenius activation energy model. A lack of breaking points in Arrhenius plots indicated that no morphological changes occur within these films in the 5 to 40 C temp. range. Activation energy values were found to be independent of film comp. and were affected only by the solvent embedded in the film. This behaviour was confirmed by analysis of the same permeability data using a modified Stokes-Einstein equation. Methyl cellulose was the most promising diffusion barrier with a permeability constant of 3.4 and 1.4×10^{-8} (mg/s cm²)(cm)/(mg/cm³) at 24 and 5 C. resp. Electron microscopy was used to examine the morphological characteristics of these films and showed they have no visible pores or channels at magnifications up to 10,000. AS

Stabilizers

Guar gums

- 1249 Patel (SP), Patel (RG) and Patel (VS). Synthesis and characterization quaternary ammonium compounds of guar gum and hydroxyethyl guar gum. *Starch/Stärke* 41(5); 1989; 192-196

The quaternary ammonium compounds of guar gum (QAGG) and hydroxyethyl guar gum ether (QAHEG) were prepared by the reaction of guar gum (GG) or hydroxyethyl guar gum ether (HEG) with amine condensates of epichlorohydrin using either aliphatic or heterocyclic tertiary amines. These quaternary salts were characterized by infra-red spectra, viscometry and thermogravimetry. The temp. characteristics like initial decomposition temp. (IDT), ten per cent volatilization temp. T_{10} , temp. of max. rate of decomposition T_{max} , integral procedural decomposition temp. (IPDT) and activation energy of QAGG and QAHEG salts are compared with those of GG and HEG. AS

Sweeteners

- 1250 Proto (M) and Leoci (B). Alternative sweeteners. Fashion or need? *Industrie Alimentari* 28(274); 1989; 793-798 (It).

The author examines the sources, natural sweeteners obtainable from plants eg. sugar beet. BV

Sucralose

- 1251 Barndt (RL) and Jackson (G). Stability of sucralose in baked goods. *Food Technology* 44(1); 1990; 62-66

Sucralose a compound that is 600-800 times sweeter than sucrose is currently under FDA review for 15 food categories including baked goods. This heat stable and high intensity sweetener which can be used in baked goods. The radio label study presented in this communication confirms the stability of high-intensity sweetener during baking. GAR

CEREALS

- 1252 Aguerre (RJ), Suarez (C) and Viollaz (PE). Relationship between energies of water sorption and diffusion in grains. *International Journal of Food Science and Technology* 24(3); 1989; 317-320

In this paper relationship between activation energy for diffusion, E_D and the BET heat of sorption, E_I determined from literature data for maize, rice, sorghum, soybean and wheat and it was found to be E_D/E_I equals 0.50. Assuming that $E_D < E_I$ diffusion was interpreted in terms of a mechanism which involves the hopping of water molecules from

one adsorption site to another. NGKR

- 1253 Oguntunde (AO) and Adebawo (OO). Water-uptake pattern during traditional soaking of cereal grains. *Tropical Science* 29(3); 1989; 189-197

The individual water-uptake patterns of some tropical cereal grains maize var. TZPB (TM), white maize (WM), white and red types of sorghum (WS and RS) and pearl millet (MI)-were determined at 30, 35, 40 C during soaking for 0-72 h. The hydration curves obtained showed that most of the moisture uptake in each of the cereal grains took place within the first 24 h, whereas the peak water-uptake or saturation moisture content occurred at about 36 h, irrespective of the soaking temp. used. The peak moisture content (% w.b.) was, however, found to increase when the soak temp. was raised from 30 to 45 C. The corresponding values of activation energy E_a for water-uptake were determined. AS

- 1254 Sadana (B) and Bajaj (S). Effect of chapathi making and pressure cooking on cereal fibre. *Beverage and Food World* 16(3); 1989; 25-26

The present investigation is carried out with the objective to find out the effect of chapathi making and pressure cooking on the composition of dietary fibre of wheat, maize and rice. SRA

Barley

- 1255 Ahokas (H) and Naskali (L). Variation of alpha-amylase, beta-amylase, beta-glucanase, pullulanase, proteinase and chitinase activity in germinated samples of the wild progenitor of barley. *Journal of the Institute of Brewing* 96(1); 1990; 27-31

One hundred seventy five strains of wild barley (*Hordeum vulgare* spp. Spontaneum) were evaluated for their malting qualities with emphasis on assay of alpha-amylase, beta-amylase, proteinase, pullulanase, beta-glucanase and chitinase activity on 5 day germinated samples. A known malting var. 'Bomi' was used as a reference malting var. Wide varietal variation was observed in the activation of all the enzymes assayed and the mean quality was higher in wild barley than 'Bomi' var. Beta-amylase and beta-glucanase activity were especially high in wild barley var. The lower alpha-amylase activity is believed to be due to inhibitors. The study indicated the feasibility of recombination of a desired enzyme gene into malting barley. NGM

- 1256 Glennie-Holmes (M), Moon (RL) and Cornish (PB). A computer controlled micromalter for assessment of the malting potential

of barley crossbreds. **Journal of the Institute of Brewing** 96(1); 1990; 11-16

An automatic computer controlled micromalter has been constructed. The instrument has sample chamber of dimension 1100 x 600 x 600 mm. There is provision for cleaning the grain, steeping and germinating under varying conditions, kilning and holding the malt at elevated temp. to prevent reabsorption of moisture. Once programmed the instrument operates automatically until kilning the malt. The instrument provides satisfactory separation between samples of differing malting quality and is suitable for routine screening of barley samples for malting. NGM

Rice

- 1257 Mahanta (CL), Ali (SZ), Bhattacharya (KR) and Mukherjee (PS). Nature of starch crystallinity in parboiled rice. **Starch/Starke** 41(5); 1989; 171-176

A type X-ray diffraction spectra of raw rice was weakened upon mild parboiling and completely disappeared in moderately severe parboiled rice. A feeble V pattern of lipid-amylose complex appeared in its place. There was no unambiguous evidence of a B-type spectra of retrograded starch, although partial and weak B-like spectra could be seen. Differential scanning calorimetry showed that raw rice flour and starch had a large gelatinization and a small lipid-amylose endotherm, the latter disappearing after defatting. The gelatinization endotherm first decreased and eventually disappeared in samples with moderately severe parboiling, but a small lipid-amylose endotherm was visible in most parboiled rice samples. On the whole, parboiled rice appeared largely amorphous with only minor crystallinity, and the peculiar properties of parboiled rice could not be definitely ascribed to a definite crystalline form of starch. AS

Rice starch

- 1258 Ghazi (A), Khalil (M) and Atta (MB). Utilization of rice starch manufacture by product. I. Preparation and evaluation of powder rich in protein and starch from rice starch manufacturer by product. **Die Nahrung** 33(9); 1989; 831-838

Preparation of powder rich in protein and starch was carried out using the light-phase solution (rice starch manufacture by-product) that was collected from the National Starch and Yeast Plant in Alexandria. Chemical and functional properties of the prepared powder were studied, and the obtained results led to the following conclusion. The recovery

yield of protein present in the powder prepared from light-house solution was 1338 kg per day; the prepared powder contained 39% protein, 55% starch and moderate amounts of Mg, Mn and Zn. Moreover, it has a good amount of leucine among the essential amino acid, and high levels of aspartic and glutamic acids of the non-essential amino acids; The oil holding capacity of the prepared powder was higher than that of albumin, where it's water holding capacity and coagulated protein were lower than those of albumin. No foam for the prepared powder was observed at pH 4, where the foam which formed at pH 7 was too low to be compared with that of albumin. Furthermore, whipping capacity increased in the presence of sugar. Generally, whipping capacity of the prepared powder was higher than that of albumin; the prepared powder could be used in preparing fried style foods or in baking technology, since it's oil holding and whipping capacities are very high compared to those of albumin. AS

Wheat

- 1259 Chambers (J), Mc Kevitt (NJ), Scudamore (KA) and Bowman (CE). Non-destructive determination of the moisture content of individual wheat grains by nuclear magnetic resonance. *Journal of the Science of Food and Agriculture* 49(2); 1989; 211-224

The non-destructive detn. of the moisture content of wheat samples as small as an individual grain would have a range of uses whether for repeated measurements, as in physiological studies of development, or to allow subsequent analysis for other factors such as pesticide residues. However, no such method has yet been described. A suitable method has now been developed using an ordinary nuclear magnetic resonance (NMR) spectrometer. With a calibration set of 100 grains, the relationship between NMR response and oven moisture content (range 3.3 to 19.6%) was described by a full quadratic model with which there was no remaining lack of fit (1.465 ns), and the repeatability of the model was acceptable (standard estimate of error 0.9995). The quality of fit of the NMR predicted moisture content to the oven moisture content for three test sets each of 100 grains was also satisfactory (standard deviation of difference 0.973 to 1.352). Using two batches of 25 fumigated grains, the method has been used to show that the difference amounts of residues of 1,1,1-trichloroethane were not related to moisture content, as had been previously suggested. AS

Wheat flour

- 1260 Horvatic (M), Gruner (M) and Mulalic (N). Relationship between protein nutritive quality and technological property parameters of wheat flour. *Die Nahrung* 33(9); 1989; 901-903

The biological value of proteins as well as their importance for the technological quality of wheat flours have been extensively researched. Apart from the other factors, gluten content, structure and functional characteristics are responsible for the flour's technological properties. Functional properties of gluten complex and thus also rheological properties of flour are influenced by the specificity and intensity of interactions among individual protein fractions and likewise of protein interactions with other flour components. Rheological properties of flour and quality of bread are changed to a greater or lesser extent, among other, by addition of free amino acids. The purpose of this work was to explore the relationship between certain essential amino acids of wheat flour and the parameters of flour rheology and breadbaking quality. AS

Wheat starch

- 1261 Silijestrom (M), Eliasson (AC) and Bjorck (I). Characterization of resistant starch from autoclaved wheat starch. *Starch/Starke* 41(4); 1989; 147-151

The nature of a particular type of in vitro undigestible starch, i.e. resistant starch (RS), was studied. This type of undigestible starch is found in products processed at relatively high moisture contents, such as baking and autoclaving. The RS was concentrated by enzymic digestion of available starch and protein and recovered by centrifugation. RS from autoclaved wheat starch was evaluated by various methods. The crystallinity was studied by X-ray diffraction and DSC. The degree of polymerization (DP) was evaluated with gel permeation chromatography and iodine binding and the starch content and linearity by enzymic methods. The results indicate that RS consist of crystallized, linear alpha-glucans of relatively low mol. wt. (DP approx. 65). The recovery of RS after various drying procedures, and the introduction of a thermostable amylase (Termamyl) in the RS assay was also studied. Oven-drying of the fibre residues used in the analysis had no significant effect on RS recovery, whereas freeze-drying was accompanied by a slight increase in RS content. The use of Termamyl, in the assay of RS in the fibre residues, decreased the yield of RS by 10-15%. AS

MILLETS

- 1262 Geervani (P) and Eggum (BO). Nutrient composition and protein quality of minor millets. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(2); 1989; 201-208

Nutrient comp. of five minor millets produced and consumed in dry land regions and tribal areas of Andhra Pradesh, India, was evaluated. The millets analysed were Italian millet (*Setaria italica*), French millet (*Panicum miliaceum*), Barnyard millet (*Echinachloe colone*), Kodo millet (*Paspalum scrobiculatum*) and little millet (*panicum miliare*). The nutrients analysed were proximate principles, amino acids, fibre components, Ca, and Fe. Protein and energy were evaluated by true digestability (TD), biological value (BV), net protein utilization (NPU) and digestible energy (DE) in rats. The protein content was higher and lysine content lower, when compared to major millets. Dehusked millets had lower total dietary fibre (TDF) and tannin. The TD of protein ranged between 95.0 to 99.3, whereas the BV was between 48.3 and 56.5. All the millets were poor sources of Ca, and Fe, with the exception of French millet. AS

Corn

- 1263 Cobbinah (JR) and Appiah-Kwasteng (J). Effects of some neem products on stored maize weevil, *Sitophilus zeamais* Motsch. *Insect Science and Its Application* 10(1); 1989; 89-92

Various neem products were compared with copra oil, palm oil and 0.25% diazinon dust for protection of stored maize against the grain weevil, *Sitophilus zeamais* Motsch. Maize kernels treated with neem oil or ash were damaged less than the control. Although copra and palm kernel oil reduced *S. zeamais* attack, these edible oils were not as effective as neem oil. Neem wood ash was however, less effective than 0.25% diazinon dust. Neem derivatives inhibited oviposition and/or deterred feeding. AS

Corn starch

- 1264 Ninomya (Y), Okuno (K), Glover (DV) and Fuwa (H). Some properties of starches of sugary-1; brittle-1 maize (*Zea mays* L.). *Starch/Stärke* 41(5); 1989; 165-167

Starch granules were prepared from kernels of sugary-1 su₁ [sweet corn hybrid P39-5Xp51-B] and its brittle-1 bt₁, sugary-1; brittle-1 (su₁ ; bt₁ , bt₁), and normal counterparts. Amylose percentage and the distribution of linear chains of amylopectin were determined by gel filtration after debranching of the starches with *Pseudomonas* isoamylase. Pasting characteristics by differential scanning calorimetry (DSC) and starch-granule susceptibility to amylase were also in maize are of a high-amylose type, easily digestible, and have lower gelatinization temp. and smaller heat of gelatinization than those of the other three genotypes, Results obtained

suggested that *bt*₁ is epistatic to *su*₁ for pasting characteristics of starch by DSC. However *su*₁ is epistatic to *bt*₁ for the ratio of fraction III to fraction II of amylopectin, and amylose content and starch-granule susceptibility to amylase are affected by both *su*₁ and *bt*₁ genes. AS

Pearl millets

- 1265 Khetarapul (N) and Chauhan (BM). Effect of germination and pure culture fermentation on HCl-extractability of pearl millet (*Pennisetum typhoides*). *International Journal of Food Science and Technology* 24(3); 1989; 327-331

Germination significantly increased inorganic P, non-phytate P and phosphorus extractable in 0.03 N HCL, the concn. of acid found in human stomach, with a corresponding decline in phytate P of pearl millet grains. HCL-extractability of Ca, Fe, Zn, Cu and Mn, an index of their bioavailability to humans, was also significantly improved by germination. Fermentation of pearl millet sprouts with mixtures of yeasts (*Saccharomyces diastaticus* or *S. cerevisiae*) and lactobacilli (*Lactobacillus brevis* or *Lactobacillus fermentum*) generally improved extractability of the minerals of the sprouts, probably because of the decreased content of phytic acid in the germinated and fermented pearl millet sprouts. AS

- 1266 Khetarpaul (N) and Chauhan (BM). Effect of fermentation on protein, fat, minerals and thiamine content of pearl millet. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(2); 1989; 169-177

Natural as well as single, mixed and sequential pure culture (*Saccharomyces diastaticus*, *S. cerevisiae*, *Lactobacillus brevis*, *L. fermentum*) fermentations of pearl millet flour for 72h lowered pH and raised titratable acidity. The fermentation either decreased or did not change the protein content of pearl millet flour. Natural fermentation either decreased or did not change the protein content of pearl millet flour. Natural fermentation increased whereas pure culture fermentation decreased the fat content. Ash content did not change. Natural fermentation at 20 C and 25 C increased whereas at 30 C it decreased the thiamine content of the pearl millet flour. Yeast fermentation raised the level of thiamine two- to three- fold, while lactobacilli fermentation lowered it significantly. AS

Proso millet

Proso millet proteins

- 1267 Nishizawa (N), Oikawa (M), Nakamura (M) and Hareyama (S). Effect of lysine and threonine supplement on biological value of proso millet protein. *Nutrition Reports International* 40(2); 1989; 239-245

This investigation was carried out to study the effect of lysine and threonine supplementation on the biological value of proso millet (*Panicum miliaceum*) protein. This was obtained from a farmer in Yamagata, Iwate, Japan and successfully dehulled by a pearler and this millet is called "Kibi" in Japan. Biological evaluation in terms of biological value was estimated by nitrogen balance studies between feces and urine and proximate analysis carried out by AOAC methods. The results showed that the first limiting amino acid was lysine (89 mg/Ng) and its amino acid score 25 was also found to be deficient in threonine. It was found by giving a diet of 10% millet protein to rats did not increase their body wt. whereas with supplementation of lysine and threonine showed normal growth. The biological value of the millet protein alone was 63.8 but greatly is improved upto 84.2 by supplementation with these amino acids. This showed by proper blending with other cereals containing much amount of these amino acids this proso millet would be hopeful as mixed food or feed. NGKR

Sorghum

- 1268 Obiozoba (IC). Mineral utilization of malted sorghum and corn with added crayfish in rats. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(2); 1989; 179-186

Forty adult rats were used to study the mineral balances of malted and unmalted wet- or dry-millet sorghum and corn combined with crayfish and fed rats for 12 days. Five out of the twelve days were for adjustment and the rest for balance period. These mixtures each was calculated to provide 1.6g N daily for the entire study period. Malting and wet milling produced increases in crude protein content of the cereal grains. However, the increases were much more evident in sorghum. Wet milling caused increases in Ca retention in corn groups. It produced the same effect on P balance only in sorghum groups. On the other hand, it produced positive Fe balances only in unmalted corn and malted sorghum groups. The results suggest improved mineral nutriture due to malting except for the Fe- retention of the MDC:CR group. AS

Sorghum malt

- 1269 Ruffell (PL) and Trinder (DW). A mini-column screening test for aflatoxins in sorghum malt. *Journal of the Institute of Brewing* 96(1); 1990; 7-10

The development of mini-column screening test for aflatoxins in sorghum malt and the finally adopted method is described. The method is based on a silica cartridge clean-up of a chloroform extract of malt followed by detection by means of an alumina/Florisil mini-column. The method is rapid, economical, more sensitive than published methods and suitable for use by semi-skilled personnel. It was deliberately designed to maximise test readings, thereby obviating false negative findings. Validation trails indicated that the method had a detection limit of approx. 3 μg aflatoxin B₁ /kg and was robust enough for routine use. The method is recommended for industrial use, provided that positive samples are confirmed by conventional analysis. AS

Sorghum starch

- 1270 Wankhede (DB), Deshpande (HW), Gunjal (BB), Bhosale (MB), Patil (HB), Gahilod (AT), Sawate (AR) and Walde (SG). Studies on physicochemical, pasting characteristics and amylolytic susceptibility of starch from sorghum (*Sorghum bicolor* L. Moench) grains. *Starch/Starke* 41(4); 1989; 123-127

Preparation, physicochemical properties, pasting behaviour and amylolytic susceptibility of sorghum starch have been investigated. The yield of starch was about 60.25%, on whole grain basis. The starch exhibited double stage swelling and low solubility pattern in an aqueous system. Viscoamylographic studies on pasting behaviour of the starch revealed a peak viscosity of 800 BU. at 8% (w/v) concn; however, it decreased considerably during cooking (viz. holding period of 30 min at 93 C). The amylose content of the starch was 23.45%. The gelatinization temp. range was found to be 68.5 - 72.5 - 78.5 C. The results indicated that the native starch hydrolyzed to a limited extent by human salivary α -amylase and glucoamylase as compared to gelatinized starch. In addition, the mode of attack by amylolytic enzymes on the native starch granules viewed by SEM has been studied in detail. AS

PULSES

- 1271 Kishonre (N), Dixit (SN) and Dubey (NK). Fungitoxic studies with *Chenopodium ambrosioides* for control of damping-off in *Phaseolus aureus* (Moong) caused by *Rhizoctonia solani*. *Tropical Science* 29(3); 1989; 171-176

The min. concn. of the essential oil, isolated from the leaves of *Chenopodium ambrosioides*, for absolute inhibition of the growth of *Rhizoctonia solani* on malt extract agar medium was found to be 1000 p.p.m. At this concn. it showed fungicidal

properties. The fungitoxicity of the *Chenopodium* oil remained unaltered after storage for 360 days, at 100 C temp. and even on introduction of high inoculum density of the test fungus. The oil was found to possess a broad fungitoxic spectrum and was non-phytotoxic. During *in vivo* studies, viz in seed treatments, the oil was found to control the damping-off of *Phaseolus aureus* by 46.3% and 63.6%, resp. at 1000 p.p.m and 3000 p.p.m. Moreover, treatment of soil with the leaves of *Chenopodium ambrosioides* controlled damping off by 70.1%. AS

- 1272 Sosulski (F), Waczkowski (W) and Hoover (R). Chemical and enzymatic modifications of the pasting properties of legume starches. *Starch/Starke* 41(4); 1989; 135-140

Refined legume starches were evaluated for their Brabender Visco/Amylograph properties in their native form and after chemical and enzymatic pretreatment during incubation for 20 h at room temp. Although exhibiting the characteristic restricted paste viscosities of legume starches, native lentil starch showed much higher viscosity parameters than navy bean starch while field pea starch had very low, stable viscosities. Pretreatments with mineral acids, alkali or enzymes failed to significantly alter the amylographs of the 8% slurries (W/V). Removal of surface lipids on the refined starch granules with propanol/water (3:1 v/v) or chloroform/methanol (2:1 v/v) increased paste viscosities substantially, as did the complexation of the starches with palmitic acid or glyceryl monopalmitate. None of the treatments resulted in complete dissolution of the starch granules and the modified starches showed no improvement in gel syneresis during storage. AS

Chickpeas

- 1273 Jood (S), Chauhan (BM) and Kapoor (AC). Protein digestibility (in vitro) of chickpea and blackgram seeds as affected by domestic processing and cooking. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(2); 1989; 149-154

Protein digestibility (in vitro) of grains of chickpea (*Cicer arietinum*) and blackgram (*vigna mungo*) cvs varied from 48 to 53% and 52 to 58%, resp. Soaking, cooking (both of unsoaked and soaked seeds), autoclaving and sprouting improved significantly the protein digestibility of all the cvs of chickpea and blackgram. Autoclaving was found to be most effective followed by cooking and sprouting; cooking of sprouts had only marginal effect. Protein digestibility was higher when soaked instead of unsoaked grains were cooked. AS

Cowpeas

- 1274 Nnanna (IA) and Dixon Phillips (R). Amino acid composition,

protein quality and water-soluble Vitamin content of germinated cowpeas (*Vigna unguiculata*). *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(2); 1989; 187-200

Amino acid comp., protein digestibility (PD), calculated protein efficiency ratio (C-PER and DC-PER), chemical scores and water-soluble vitamin content of cowpea seeds germinated at 25 °C or 30 °C for 24 h were determined. Also, the effect of processing steps (heated-air drying, decortication and cooking) on these parameters were examined. Germination had little effect on amino acid profile of cowpeas. *In vitro* PD was not improved significantly by germination nor by decortication but was improved by cooking. C-PER and DC-PER ranged from 1.95 to 2.21 and from 1.63 to 1.82, resp. DC-PER compared well with reported rat PER of cowpea products and seemed more sensitive than C-PER. Based on whole egg values, chemical scores ranged from 37.7 to 45.8% (mean plus or minus SD; 42.2 plus or minus 2.4%). Germination increased the contents of niacin, thiamin and riboflavin significantly. Decortication resulted in up to 30% loss in niacin while thiamine content was reduced to 41% by cooking. AS

Field beans

Field bean proteins

- 1275 Suchkov (VV), Popello (IA), Bikbov (TM), Grinberg (VY), Dianova (VT), Polyakov (VI), Muschiolik (G), Schubring (R), Schmandke (H) and Tolstoguzov (VB). Non-spinneret formation and functional properties of fibrous texturates based on a liquid two-phase system water-casein-field bean protein isolate. *Die Nahrung* 32(7); 1988; 679-689

The effects of pH, CaCl concn. and coagulation temp. on sol-fraction yield during the formation of fibrous texturates from casein, field bean protein isolate (FBPI) and their mixtures have been studied. The optimal coagulation conditions in terms of least sol-fraction yield were pH 7.0, 0.04 M CaCl and 100 °C. These conditions allow one to avoid neutralization and numerous washings of the texturates. Also studied were functional properties of texturates with varied content of the protein components as well as organoleptic properties of fish products in which 20% of fish was replaced with the texturates. Due to the effect of texturates the general acceptability of the products will be improved and the losses during cooking will be reduced. AS

Lime beans

- 1276 Egbe (IA) and Akinyele (IO). Effect of cooking on the antinutritional factors of lima beans (*Phaseolus lunatus*). *Food*

Chemistry 35(2); 1990; 81-87

Lima beans (*Phaseolus lunatus*) obtained locally were analysed for inherent antinutritional factors such as trypsin inhibitors, phytohemagglutinin, polyphenols and cyanogenic glucosides. The effect of processing (cooking) on the residual levels of these antinutritional factors, as well as crude protein and *in vitro* protein digestibility, was also determined. The raw samples, cooked samples and cooking water were found to contain various levels of the antinutritional factors determined. Significant differences ($P < 0.05$) were observed between the raw and cooked samples for all parameters analysed. AS

Mungbeans

- 1277 Ramesh Babu (T), Sudheer (Reddy (V) and Hussaini (SH). Effect of edible and non-edible oils on the development of the pulse beetle (*Callosobruchus chinensis* L.) and on viability and yield of mungbean (*Vigna radiata* (L.) Wilezek). *Tropical Science* 29(3); 1989; 215-220

The effect of pre-storage seed treatment of mungbean (var. PS-16) with neem, Karanja, mustard, groundnut and castor oils, each at 2.5, 5.0 and 10.0 ml/kg of seed was studied during the period May, 1985 to August, 1987. Treatments with Karanja oil (5 and 10ml/kg) and castor oil (10ml/kg) effectively reduced bruchid oviposition under artificial inoculation, while maintaining a high level of germination for over 18 months of storage under ambient conditions. After 24 months of storage the yield of neem oil-treated seed was significantly lower. AS

Pea soups

- 1278 Mattila (T) and Ahvenainen (R). Preincubation time and the use of oxygen indicators in determining the microbiological quality of aseptically packed pea and tomato soup. *International Journal of Food Microbiology* 9(3); 1989; 205-214

In order to get accurate information about the preincubation time needed for viscous aseptic products, the growth characteristics of three food poisoning organisms *Staphylococcus aureus*, *Clostridium perfringens* and *Bacillus cereus* in pea soup, and one spoilage organism, *Lactobacillus plantarum*, in tomato soup, were followed during a preincubation period at 30 C for 14 days. The sterile food packs were sealed into polyamidepolyethylene laminate bags containing different headspace gas concn. (21% O plus 80% N, 5% O + 95% N and 100% N). Bacterial growth was followed every second day by counting the number of CFU and following the headspace O and carbon dioxide concn. The bacterial strains differed in their growth

characteristics, especially in their ability to consume O₂ from the headspace, and also in their ability to produce carbon dioxide. The headspace O₂ concn. was also followed by O₂ indicators in order to determine the correlation with the O₂ concn. of the headspace and the growth of bacteria. The bacterial growth followed more closely the concn. of carbon dioxide than the concn. of O₂. It was concluded that further studies are needed to determine the preincubation period for viscous aseptic products in order to furnish accurate data on the growth characteristics of low numbers of bacteria in aseptic at different headspace gas compositions. AS

Pigeon peas

- 1279 Saxena (RP), Laxmi Chandi), Garg (GK) and Sing (BPN). Effect of bicarbonate soaking on dehusking efficiency and composition of pigeon pea (*Cajanus cajan* L.) seeds and dhal. **International Journal of Food Science and Technology** 24(3); 1989; 237-241

In this investigation the effect of various treatments for dehusking of pigeon pea (*Cajanus cajan* L.) have been studied in order to get the max. dhal soaking pigeon pea seeds in 6% sodium bicarbonate solution for 1 h, followed by oven drying to 10% showed improvement from 66% in untreated seeds or 71% in water soaked seeds similarly dried to 94% yield of dhal. This treatment was found to reduce gum and pectin content, increase enzyme activity, but caused losses in protein and starch content of the dhal. NGKR

OILSEEDS AND NUTS

Rapeseeds

- 1280 Ahuja (KL), Batta (SK), Raheja (RK), Labana (KS) and Gupta (ML). Oil content and fatty acid composition of promising Indian *Brassica campestris* L. (Toria) genotypes. **Qualitas Plantarum - Plants Foods for Human Nutrition** 39(2); 1989; 155-160

Seeds of sixty four genotypes of *Brassica campestris* L. (Toria) were analyzed for oil content and fatty acid comp. Oil content varied from 38.9% to 44.6%. Major fatty acids viz. oleic, linoleic, linolenic, eicosenoic and erucic acids exhibited ranges from 10.1% to 17.3%, 5.9% to 14.5% 5.2% to 15.0%, 7.7% to 13.7% and 39.6% to 59.9%, resp. Compared to the standard cv. ITSA, four genotypes contained 5 to 8% lower content of erucic acid; and six genotypes contained significantly higher content of linoleic acid. Oil was positively correlated with erucic acid. The observed inverse

relationship between linoleic and erucic acid contents might be utilized in breeding nutritionally better *Torica* cvs. with both high linoleic and low erucic acid contents. AS

- 1281 Tholen (JT), Shifeng (S) and Truscott (RJW). The thymol method for glucosinolate determination. *Journal of the Science of Food and Agriculture* 49(2); 1989; 157-165

This paper details exp. aimed at optimising the conditions for the detn. of glucosinolates in rapeseed (*Brassica napus* L) using the colorimetric thymol procedure. Glucose could be substituted for sinigrin when preparing a standard curve for glucosinolate detn. unless a correction factor was employed. The value of this factor was found to depend on the concn. of sulphuric acid. Although the coloured complexes formed between thymol and either glucose or sinigrin were found to be unstable at 100 C, the sinigrin/glucose colour ratio remained relatively constant for incubation times from 40 to 60 min. It was found necessary to increase the amount of thymol present to a final value of 0.23% to ensure complete reaction of glucosinolates. The revised method can be employed successfully for the analysis of glucosinolates in both seed and meal. AS

Soybeans

- 1282 Asano (M), Okubo (K) and Yamauchi (F). Effect of immersing temperature on the behaviour of exuding components from soybean. *Journal of Japanese Society for Food Science and Technology* (Nippon Shokuhin Kogyo Gakkaishi) 36(8); 1989; 636-642 (Ja).

The saponins and flavonoids responsible for undesirable taste are associated with proteins or carbohydrates at a lower temp., but they are liberated from these proteins or carbohydrates at a higher temp. The effects of immersing temp. on the swelling behaviour of soybean, on the exuding components from soybean into water and on the lipoxxygenase activities of swelled soybean were studied. The swelling time of soybean was reduced with elevation of the temp., but the solid materials exuded from soybean into water was increased. The solid materials exuded from whole soybean into water, which were 2 - 8% of whole soybean as dry matter, contained 60 - 77% carbohydrate and 8 - 14% crude protein. The main component of this crude protein was identified as basic 7S globulin. On the other hand, the solid materials exuded from soybean cotyledon, which were 8 - 13% of soybean cotyledon as dry matter, contained 57 - 65% carbohydrate and 11 - 22% crude protein. Further, saponin A group which was the most undesirable component of soybean and many other unidentified components were observed in an exuding solution from whole soybean immersed over 50 C. The lipoxxygenase activities contained in

soybean swelled at 60 C were 50% lower than those in soybean swelled at 20 C, and any activity could not be detected in a sample prepared at 70 C. AS

- 1283 Hayakawa (I), Urushima (T), Sakamota (K), Fujio (Y) and Kawazoe (T). Effects of particle size on the texturisation of full fat soybean powder using a twin-screw extruder. **Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)** 36(8); 1989; 651-657

When whole soybeans are texturized using a twin-screw extruder, the effect of particle size and its distribution on texturization has been studied. The filling and melting condition in the barrel and the thermal efficiency of the equipment were also examined. The table feeder was operable at a constant rate of supply in a wide range of particle distribution but was greatly affected by the bulk density of the material. Increase of the rate of supplying material accelerated the filling in the barrel, in which the mean filling ratio in the barrel becomes about 38% at a rate of 47 kg/h. At the least, the density in the kneader unit was considered close to the highest density of filling. The thermal capacity of melting soybeans was 14.8 (J/g) according to the DSC analysis. Using a thin-groove type screw and barrel (L/D = 12), a thermal efficiency of about 46% was estimated in the texturizing process of pulverized hulled soybeans. AS

- 1284 Toiuguchi (S), Hayashi (K), Adachi (Y), Motoki (M) and Haraguchi (K). Purification and characterization of soybean oxidase. **Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)** 36(7); 1989; 597-602

Polyphenol oxidase (EC. 1.10.3.1, PPO) of defatted soybean has been purified by ammonium sulphate fractionation, DEAE-Toyopearl column, Con A-sepharose column, Phenyl-sepharose CL-4B column and Mono Q column chromatography. The purified enzyme oxidized pyrogallol and phloroglucinol. The enzyme fraction showed max absorbance at 403nm exhibited brown colour. The enzyme also has peroxidase (EC, 1.11.1.7, POD) activity. Through the purification procedures, PPO and POD activities have been eluted in the same fraction and the ratio of the both specific activities stayed constant. The mol. wt. of the purified enzyme is estimated to be 47000 by sodium dodecyl sulphate polyacrylamide gel electrophoresis. The optimum pH of POD and PPO are 5.5 and over 7.5, resp. Both activities are stable at 80 C for 10 min and are inhibited by potassium cyanide and L-ascorbic acid. AS

Soy products

Miso

- 1285 Okada (Y), Yamaguchi (N) and Yoshii (H). Extraction of bitter components from non-salted soybean miso. Studies on the reduction of salt concentration in fermented foods. Part XII. *Journal of Japanese Society for Food Science and Technology* (Nippon Shokuhin Kogyo Gakkaishi) 36(8); 1989; 625-630 (Ja).

Defatted non-salted soybean miso (DF-NSSM) and a water-soluble fraction (W-S) of non-salted soybean miso (NSSM) were extracted by n-butanol or sec-butanol, in order to separate the bitter components. (1) the yields of n- and sec-butanol soluble fractions extracted from DF-NSSM were 10 and 13% resp., and those from W-S were 16% each. 2) In the butanol soluble fraction (Bu-S), a small quantity of free and bound type hydrophilic amino acids and a lot of hydrophobic amino acids which were in the order leucine > phenylalanine > isoleucine > valine were detected. The ratio of bound type amino acids was higher for hydrophilic amino acids and lower for hydrophobic amino acids. In the butanol insoluble fraction (Bu-Ins), a small quantity of free and bound type hydrophobic amino acids and a lot of hydrophilic amino acids were detected. The ratio of those bound types was almost the same as in the case of Bu-S. (3) It was noticed that almost all the bitter components of NSSM was contained in W-S, and by butanol extraction of W-S, free hydrophobic amino acids were concentrated to about 2 times those in W-S, those bound types to about 4 times those in W-S. AS

Soy proteins

- 1286 Garcia chacon (EJ), Satterlee (LD) and Hanna (MA). Heat induced gels from partially hydrolyzed soy protein isolate. *Journal of Food Biochemistry* 14(1); 1990; 15-29

Heat induced gels can be obtained from partially hydrolyzed soy protein isolate (HSPI). The gel forming ability of each of the HSPI fractions (peptides of varying mol. wt. and solubility) were studied, after being separated by preparative Sephadex gel filtration chromatography. The insoluble peptide fraction had no gel forming ability. Peptides larger than 5,000 Daltons, those lower than 5000 Daltons and a fraction of the very hydrophobic peptides formed weak gels when heated alone. Interactions between several peptide fractions were necessary in order to yield a gel with the strength of the one formed by whole HSPI. A mechanism explaining (1) the action of the proteolytic enzyme in breaking down the protein and (2) the peptide interaction needed for the gel formation is proposed. AS

- 1287 Hastnett (EK) and Satterlee (LD). The formation of heat and enzyme induced (plastein) gels from pepsin-hydrolyzed soy protein isolate. *Journal of Food Biochemistry* 14(1); 1990; 1-13

A gel prepared by heating pepsin-hydrolyzed soy protein isolate (HSPI) had a higher turbidity and viscosity and less solubility than did its starting hydrolyzate. The gelling characteristics of the heated hydrolyzate were possibly due to hydrophobic interactions, as opposed to peptide bond reformation. The presence of pepsin was found to be necessary for gel formation at 37 C but could be successfully replaced by heat. Incubation of the concentrated HSPI at 95 C for 30 min was optimal for heat-induced gel formation. When soy protein isolate (SPI) was hydrolyzed with papain or bacterial protease, little gelation occurred (either by heat or enzyme induced gelation treatments). AS

- 1288 Kamata (Y), Takahata (H) and Yamauchi (F). Gelling properties of cleaved soybean globulins by limited proteolysis. *Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)* 36(7); 1989; 557-562 (Ja).

Soybean protein gels have high water holding capacity and elasticity. Attempts have been made to make the protein have other characteristics by limited hydrolysis with a proteolytic enzyme. Native soybean beta-conglycinin and glycinin were hydrolyzed limitedly by trypsin. When viscosity change was monitored during heat treatment, viscosities of cleaved glycinin and beta conglycinin were lower than those of the intact globulins and started to rise at around 55 C and 70 C, resp. These temp. were lower than that (approx. 90 C) of native globulins, which indicated that the cleaved globulins became unstable. Lower hardness values were observed on the cleaved globulins than those of intact globulins by texture profile analyses. On the other hand, the gels of the cleaved globulins had brittleness which was not observed on the intact globulins. White and rough gels which resembled to fu or cheese curd were obtained from the cleaved glycinin, whereas transparent and fragile gels were obtained from the cleaved beta-conglycinin. These results suggest that gelling properties of these globulins can be modified by limited proteolysis. AS

- 1289 Suchkov (VV), Grinberg (VY), Bikbov (TM), Muschiolik (G), Schmandke (H) and Tolstoguzov (VB). Non-spinneret formation and functional properties of fibrous texturates based on a liquid two-phase system water-casein-soy protein isolate. *Die Nahrung* 32(7); 1988; 669-678

The effects of pH, CaCl₂, concn. and coagulation temp. on the yield of sol-fraction during the formation of fibrous texturates made of soy protein isolates (SPI) and their

mixtures with casein were studied. The optimal conditions in terms of least protein loss were pH 7.0, 0.05 M CaCl₂ 99 °C. Also studied were functional properties of the fibrous texturates having different relative amounts of the protein components as well as organoleptic properties of combined meat products with a 24% substitution of meat for fibrous texturates. Combined meat products containing fibrous texturates with a casein SPI ratio of 1:1 has the best organoleptic and technological properties. AS

- 1290 Umeya (J-I), Kamata (Y) and Yamauchi (F). Role of disulphide bond on hardening and softening properties of soybean protein-water suspending systems. *Journal of Japanese Society for Food Science and Technology* (Nippon Shokuhin Kogyo Gakkaishi) 36(8); 1989; 658-663

Effects were studied of 2-mercaptoethanol (2-ME) or reduction-carboxyamide methylation on apparent viscosity of soybean globulin suspending systems. Viscosities of gels formed with lower 2-ME concn. (0.01 and 0.02 M) were lower than those of gels without 2-ME after heat treatment. Formed gels, however, had the highest viscosities with higher 2-ME concn. (0.03 and 0.1 M), which indicated the mol. expansion resulting from cleavage of intramolecular disulphide bonds. The roles of protein components (7S and 11S globulin) and sulphhydryls of these proteins on gel viscosity were studied by blocking the sulphhydryls of these proteins. Completely reduced and carboxyamide methylated (RCAM-) 7S globulin showed the highest viscosity after heat treatment, which indicated that the gel networks were mainly made by hydrogen bonds. On the other hand, RCAM-11S globulin did not make gels even after heat treatment which suggested important roles of the disulphide bridges on network formation in the case of 11S globulin gel. AS

Sunflowers

- 1291 Swetman (AA) and Harris (RV). Small-scale sunflower seed processing in rural Zambia. *Tropical Science* 29(3); 1989; 157-169

Sunflower proteins

- 1292 Hoernicke (E), Lewerenz (H-J) and Mieth (G). Toxicological animal studies of protein isolates from sunflower seeds. *Die Nahrung* 32(7); 1988; 691-700

Safety evaluations of sunflower protein isolates (SPI) obtained by various processes were performed in subchronic (90-days) feeding studies using male and female rats as experimental animals. General appearance, food consumption and

efficiency, haematology, kidney function and urine analysis, serum chemistry including detn. of enzyme activities, organ wt. and macro- and microscopic pathology were used as criteria to disclose adverse effects. Feeding graded levels of SPI as supplements up to 75% of the total protein of the diet revealed no morphologic and functional changes attributable to toxic effects of the test product at daily intakes up to 13 g /kg body wt. The evaluations of the SPI-variants tested were similar. AS

Walnuts

- 1293 Jain (S). Problems of walnut exports from Jammu and Kashmir. *Packaging India* 21(3); 1988; 21-23

Industrial technological status and modernisation (walnut processing industrial estate in Jammu, Duty-Free import of walnut processing and packaging machinery), policy frame work (Replenishment import licence, duty drawback, bank interest, up-grading of communication means, income tax exemption on compulsory local sale), trade environment (delegation of walnuts exporters, withdrawal of import duty on walnuts overseas), quality control and inspection (self certification), and other constraints are covered briefly. SRA

TUBERS AND VEGETABLES

- 1294 Campos (R), Guerra (R), Aguilar (M), Ventura (O) and Camacho (L). Chemical characterization of proteases extracted from wild thistle (*Cynara cardunculus*). *Food Chemistry* 35(2); 1990; 89-97

Three protease fractions were obtained by purification of the thistle extract with ammonium sulphate. The optimum pH and temp. on the proteolytic activity of the crude extract was found to be 5.7 and 37 C. resp. The crude extract had a lower clotting activity and a stronger proteolytic activity than commercial rennets. However, the protease fractions showed a sharp increase in clotting activity and a decrease in proteolytic activity compared to the extract, indicating the proportion of the extract proteolytic activity within the fractions. Therefore, the ammonium sulphate fractionation gives clotting activity and proteolytic activity in a ratio close to a commercial fungal rennet extracted from *Mucor miehei*. The electrophoretic pattern of the fractions showed qualitative differences in the number and intensity of bands. However, the major differences were detected in the 50% ammonium sulphate fraction, which also had the highest milk

clotting activity. Therefore, correlations between the specific milk-clotting activity and the number and intensity of the electrophoretic bands of the 50% fraction were established. AS

Tubers

Cassava

- 1295 Srikantha (S), Jaleel (SA), Kunhi (AAM), Rehana (F), Ghildyal (NP), Lonsane (BK) and Karanth (NG). Downstream processing of the hydrolysate from cassava fibrous waste in the production of confectioner's syrup. *Starch/Starke* 41(5); 1989; 196-200

The acid hydrolysis of starch present in cassava fibrous waste results in a formation of brownish yellow hydrolysate due to the use of higher acid concn. than that needed in case of pure starch. Thus, it dictates application of stronger downstream processing unit operations such as deproteinization, clarification and decolouration. Among the various deproteinizing agents evaluated, bentonite and kaolin were found to be the best and their use resulted in the removal of 20% protein and 60-70% red as well as yellow colours. Kaolin was selected based on economic considerations. The data indicated that 5% (w/v) kaolin. 10 min contact time at 25 C and a pH of 1.0-1.5 of the hydrolysate were suitable. For complete decolouration, 0.5% (w/v) activated carbon at 25 C with a contact time of 30 min was needed. Treatment with activated carbon also results in protein removal and is max. at 40 C. These stronger down-stream processing unit operations lead to an acceptable product conforming to the standard. AS

Potatoes

- 1296 Ferdinand (JM), Kirby (AR) and Smith (AC). The extrusion rheology of dehydrated potato. *Journal of Food Engineering* 10(1); 1989; 73-80

Using the brabender viscoamylograph the rheological characteristics of different dehydrated potato granules are often compared. The resulting pasting characteristics are not found to be readily applicable to low moisture extrusion cooking, particularly in combination with starch based additives. Using capillary rheometry and compaction techniques the rheological behaviour of different techniques the rheological behaviour of different potato granule types singly and when mixed with additives at low moisture contents were studied. The pilot scale single screw extrusion of these materials showed the marked effect of the additives on the operating conditions. The relationship between the pressure generation in the extruder has been stressed. NGKR

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Potato flour

- 1297 -Mackey (KL), Ofali (RY), Margan (RG Steffe (JF). Rheological modeling of potato flour during extrusion cooking. *Journal of Food Process Engineering* 12(1); 1990; 1-11

A generalized model for predicting the effects of shear rate, temp., moisture content, time-temp. history and strain history on viscosity has been evaluated for extruded potato flour doughs. An Instron Capillary Rheometer and a 50 mm Baker Perkins co-rotating twin screw extruder were used to evaluate all affects incorporated in the model, except strain history. The power law model was used to describe shear rate effects in the range $10-10000 \text{ s}^{-1}$. The generalized model fit observed data for temp. of 25-95 C and moisture contents ranging from 22 to 50%, wet basis. Since potato flour by its manufacturing process is pregelatinized, it was unnecessary to evaluate the effects of time-temp. history. Strain history was found to have an insignificant influence on the viscosity. AS

Potato starch

- 1298 Bjorck (I), Gunnarsson (A) and Ostergard (K). Study of native and chemically modified potato starch. Part II. Digestibility in the rat intestinal tract. *Starch/Starke* 41(4); 1989; 128-134

The *in vivo* digestibility of the following chemically modified potato starch derivatives was evaluated in rats; distarch phosphate (DSP) acetyl di-starch phosphate (ADSP) and hydroxypropyl di-starch phosphate (HPDSP). Unmodified potato starch was used as reference. The starches were studied raw and after gelatinization by drum-drying. The extent of *in vivo*-digestion was evaluated through balance exp. in normal rats (apparent digestibility) and in rats treated with an antibiotic drug to suppress hind-gut fermentation (true digestibility. Starch digestibility was calculated from direct measurement of starch in feed and faeces. Three different methods for starch analysis were compared. The apparent digestibility of raw potato starches was low, ranging from 50 (HPDSP) to 84% (ADSP). The true digestibility of gelatinized unmodified potato starch was essentially complete and was not affected to any appreciable extent as a result of cross-linking or acetylation. In contrast, etherification with hydroxypropyl significantly reduced the extent of digestion and absorption to a low level, about 50%, which was not significantly different from that with the corresponding raw material. Thus, the digestibility of the HPDSP derivative was not improved by gelatinization. The maldigested hydroxypropylated starch fraction was only metabolized to a limited degree by the hind-gut microorganisms. AS

Vegetables

- 1299 Krelowska-kulas (M). Determination of the level of lead, cadmium, copper, zinc, and iron in selected foods. *Die Nahrung* 32(7); 1988; 649-652 (De).

Vegetables from allotment gardens in the area of Krakow, from the trade (produced at a distance of about 25 km from Krakow), and from farms situated about 100km from Krakow (control samples) were investigated by atomic absorption spectroscopy. In the vegetables from the allotment gardens the levels of the determined elements were on an average several times higher ($P < 0.01$) than that of the controls. In a few cases the max. levels of some elements were near the admissible limit. Furthermore, Pb, Cd, Cu, Zn, and Fe were determined in pigs and cattle (muscle, kidney, liver). The average levels of Pb and Cd gave no reason for objection. AS

Cucumbers

Cucumber pickles

- 1300 Howard (LR) and Buescher (RW). Cell wall characteristics and firmness of fresh pack cucumbers pickles affected by pasteurization and calcium chloride. *Journal of Food Biochemistry* 14(1); 1989; 31-43

Changes in cell wall pectic substances, degree of pectin methylation, bound Ca^{++} , neutral sugar comp., and firmness were determined in mesocarp tissue of pasteurized and non-pasteurized fresh pack cucumber pickles. Large changes in solubility characteristics of pectic substance occurred in cell walls of non-pasteurized pickles that were attenuated by pasteurization. In particular, water and alkali soluble pectins declined, and nonextractable pectins increased during the first month of storage. The major changes in pectic substance solubility appeared to be related to reductions in the degree of pectin methylation with a minor influence of $CaCl_2$. Galactose in cell walls of non-pasteurized pickles was substantially reduced, and the reduction in galactose was hindered by $CaCl_2$ or pasteurization. The amount of bound Ca^{++} appeared to be associated with tissue firmness after one month in storage, since firmer tissue had more cell wall bound Ca^{++} . While firmness was associated with the amount of bound Ca^{++} , the amount of bound Ca^{++} , was dependent on the supply of Ca^{++} and the degree of pectin methylation. AS

Leafy vegetables

Amaranthus

- 1301 Ayorinde (FO), Ologunde (MO), Nana (EY), Benard (BN) and Afolabi (OA). Determination of fatty acid composition of *Amaranthus* species. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1812-1814

Fatty acid comp. of the seed oils from 18 var. of *Amaranthus* sp. have been determined after room temp. transesterification. Consistent with earlier studies, wide variations in the fatty acid comp. are reported, and appear to be agronomically related. All var. show significant levels (2-5%) of squalene and a combined linoleic acid and oleic acid occurrence of between 70-80%. This study represents the first reported fatty acid comp. of grain *Amaranthus* cultivated in West Africa. AS

Amaranthus paniculatus

- 1302 Wahkhede (DB), Gunjal (BB), Sawate (RA), Patil (HB), Bhosale (MB), Gahilod (AT) and Walde (SG). Studies on isolation and characterization of starch from rajgeera grains (*Amaranthus paniculatus* Linn). *Starch/Stärke* 41(5); 1989; 167-171

Isolation and some of the important physicochemical properties of starch from rajgeera grains have been investigated. The yield of starch was about 61.2%, on whole grain basis. The results on physicochemical properties revealed that it exhibited moderate swelling and higher solubility (55.5%) in water, as compared to other millet starches. An extensive solubility in dimethylsulphoxide (72.5%) of the starch indicated easy penetration of solvent in a granular matrix, may be due to labile and heterogenous bonding forces within the granules. Brabender viscoamylographic data on pasting characteristics revealed that it yielded low viscosity (448 B. U.) at concn. of 10% (w/v) and showed very little tendency to retrograde during cooling of the starch paste. The amylopectin content was 88.5% indicating the starch of rajgeera is probably waxy in nature. Amylolytic digestibility of native and gelatinized starch of rajgeera by human salivary alpha-amylase and glucoamylase was investigated. AS

Spinach

- 1303 Ragab (M). Studies on freezing of partially dehydrated spinach. *Die Nahrung* 32(7); 1988; 701-707

Spinach (*Spinacea oleracea*) was dehydrated at 70 C, partially dehydrated frozen (dried to its critical moisture ratio and frozen at -20 C) and frozen at -20 C. Results indicated that the time required for spinach dehydration was 7 h. Thus, the moisture ratio was 10.1 and 0.054 for the fresh

and dried spinach, resp. The critical moisture ratio during dehydration process was 2.20 after 2.65 h of drying time. Reducing sugars, free amino N, ash, Fe and Mg were slightly decreased in the partially dehydrated frozen spinach relative to the fresh samples. Dehydration markedly degraded the total chlorophyll, chlorophyll a, chlorophyll b, carotenoids and ascorbic acid whereas the freezing of partially dehydrated spinach and freezing process were less effective. On the other hand, freezing of partially dehydrated spinach increased phaeophytin. There were no changes in pH-values of studied preserved samples. Freezing of partially dehydrated spinach improved the reconstitution of product at 100 C and at room temp. (25 C) comparing to dehydration. The drip loss of frozen spinach was 16.4% after 105 min of thawing time. Cooked fresh and frozen spinach were better in colour, flavour, texture, appearance and shape and over-all acceptability than that of dehydrated cooked one. Moreover, freezing of partially dehydrated spinach improved the afore mentioned properties. AS

Tomatoes

- 1304 Rushing (JW) and Huber (DJ). Mobility limitations of bound polygalacturonase in isolated cell wall from tomato pericarp tissue. *Journal of the American Society for Horticultural Science* 115(1); 1990; 97-101

Enzymically active cell wall isolated from mature green and ripening tomato cv. 'Rutgers', fruit was employed to investigate the mobility of the enzyme polygalacturonase (PG). Cell wall from 'Rutgers' var. tomato which alone exhibits little or no release of pectin, were unaffected by the addition of enzymically active cell wall from the ripening Rutgers' fruit indicating that PG is either not transfer at all or is not transferred to the sites of pectin hydrolysis. The quality of pectin released by the addition of soluble PG to enzymically active wall depended on the quantity of enzyme added. Pectin release diminished with time but upon transfer to fresh buffer triggered the resumption of autolytic activity of the enzyme indicating that an inhibitor is released during the cause of pectin hydrolysis. BAP

FRUITS

- 1305 Dalal (VB) and Nagaraja (N). Treatments, packaging and storage of some commercial fruits of India. *Beverage and Food World* 16(3); 1989; 17-23
- 1306 Elisabetta Gurzoni (M), Gardini (F) and Duan (J). Interactions between inhibition factors on microbial stability of fruit

based systems. **International Journal of Food Microbiology** 10(1); 1990; 1-18

Measurement of metabolic carbon dioxide by headspace gas chromatography was used in the preparation of shelf-life maps of fruit-based systems. The systems analysed, all of which were peach-based, differed with respect to water activity (0.995, 0.934 and 0.890), pH (3.02, 3.60 and 4.09) and benzoic acid concn. (0, 100 and 200 p.p.m). The test microorganism was a strain of *Saccharomyces cerevisiae* isolated from spoiled soft-drinks and chosen for its characteristic of multiple resistance. Three different thermal treatments were applied (54 C for 15 min, 58 C for 8 min, 63 C for 3 min) to the systems and their effectiveness was evaluated in relation to be untreated controls. In contrast with observations for osmotolerant sp., the relative preservative effectiveness on the test strain decreased with reducing water activity and showed only a slight synergistic action with thermal treatment. Besides the water activity systems interacted synergistically with the thermal treatment effectiveness in a manner differing from that described for osmotolerant sp. AS

Apples

- 1307 Kratchanov (C), Denev (P) and Kratchanova (M). Reaction of apple pectin with ammonia. **International Journal of Food Science and Technology** 24(3); 1989; 261-267

In this paper the preparation of amidated apple pectins in aqueous and aqueous-alcoholic media and the factors influencing both ammonolysis and hydrolysis of the ester groups of apple pectin were studied. It was seen in aqueous solution the extent of ammonolysis and hydrolysis was very much dependent upon ammonia concn. and in aqueous alcohol the products were also dependent upon the type of alcohol and its concn. with increasing concn. of alcohol the hydrolysis is suppressed. It was also shown that the extents of ammonolysis and hydrolysis of the ester groups are significantly affected by the polarity of the medium and the acid-base equilibrium of the interaction of ammonia with water. The rate of enzymic hydrolysis of amidated pectins decreases with increasing amide content and reaction mechanism is proposed. NGKR

- 1308 Lidster (PD). Storage humidity influences fruit quality and permeability to ethane in 'McIntosh' apples stored in diverse controlled atmospheres. **Journal of the American Society for Horticultural Science** 115(1); 1990; 94-96

The present study determined that 'McIntosh' apples stored in controlled atm. and low oxygen (LO) required different humidity control for optimal CA storage. High storage relative

humidity (RH) resulted in firm and very high RH resulted in internal and peenescent breakdown, which suggests that a low RH near 89% to 94% is best suited for controlled atm. storage of 'McIntosh' apple. BAP

Grapes

- 1309 Thakur (BR) and Arya (SS). Studies on stability of blue grape anthocyanins. *International Journal of Food Science and Technology* 24(3); 1989; 321-326

In this investigation the results of studies on the effect of pH, water activity, packaging materials, preservatives and sugar level on the stability of blue grape anthocyanins in isolated model systems and in grape squash and juice are presented. The investigations showed that the stability of grape anthocyanins in grape and juice is influenced by the nature of packaging materials and preservatives. It has also been seen that the losses in grape squash were 65-70% in glass bottles, 64-67% in paper-aluminium foil polyethylene (PFP) laminate pouches, 77-81% in polypropylene (PP) pouches and 68-73% in metallized polyester-polyethylene (MPP) laminate pouches during 60 days storage at -15 to -35 C. The losses were found to be lower after 60 days in samples preserved with sorbate than with benzoate but not after 120 or 180 days storage sugar caused increased losses of anthocyanins which were found to be more stable in model systems than in grape products. NGKR

Kumquat

- 1310 Chalutz (E), Lomaniec (E) and Waks (J). Physiological and pathological observations on the post-harvest behaviours of kumquat fruit. *Tropical Science* 29(3); 1989; 199-206

Kumquat (*Fortunella margarita* Lour. Swingle) fruit is characterized by a relatively short post-harvest life. Non treated fruit could be stored for several wks at 8 to 11 C: at lower storage temp., chilling injuries resulted in increased decay. With the progression of the picking season and the corresponding change of the peel colour from yellow-green to yellow and orange, susceptibility of kumquat fruit to post-harvest rots gradually decreased. Tearing of peel at the stem end during picking was the major cause of post-harvest rots, and could be markedly reduced by careful picking with fruit clippers. The respiration rate of kumquat was relatively high and decreased rapidly after harvest. This could be associated with ;relatively rapid changes in chemical comp. and fruit deterioration, compared with most other citrus fruit cvs. AS

Mangoes

- 1311 Parmar (SS) and Sharma (RS). Effect of mango (*Mangifera indica* L.) seed kernels pre-extract on the oxidative stability of ghee. *Food Chemistry* 35(2); 1990; 99-107

A pre-extract (PE) prepared by heating mango (*Mangifera indica* L.) seed kernel powder (MSKP) and ghee (1:1 w/w) to 120 C contained 430 mg% phospholipids and 224 mg% water-extractable phenolic compounds. The presence of at least eleven phospholipids in a chloroform methanol extract of MSKP and eight water soluble phenolic compounds in PE was confirmed. Addition of the PE to ghee at 4, 6, 8 and 10% (v/v) levels increased the phospholipid content of ghee samples over the control to 11.2, 20.9, 26.4 and 34.4 mg% of ghee and those of water-extractable phenolic compounds to 7.4, 11.1, 15.5 and 20.7 mg% of ghee, resp. The samples of ghee with added BHA contained levels of these compounds similar to those of control samples. The antioxidant potentialities calculated from the induction periods of ghee samples stored at 80 C in comparison to control were in the order 1.3 (0.02% BHA) < 2.6 (4% PE) < 2.9 (6% PE) < 3.1 (8% PE) < 3.2 (10% PE) suggesting that the phospholipids and the phenolic compounds of MSKP, transferred to ghee, help enhance the shelf-life by protecting against autoxidation. AS

Oranges

- 1312 Sugisawa (H), Yamamoto (M) and Tamura (H). The comparison of odour quality of volatiles in peel oils of four kinds of Navel orange. *Journal of Japanese Society for Food Science and Technology* (Nippon Shokuhin Kogyo Gakkaishi) 36(7); 1989; 543-550 (Ja).

To elucidate the difference of aroma quality among four navel oranges which are very closely related sp. the odour quality of volatiles in peel oil was studied by the methods of organoleptic and statistics. The essential oil was prepared by simultaneous distillation-extraction from four kinds of navel oranges, such as Washington (CITRUS SINENSIS OSBECK, WASHINGTON), Hukumotobeni (C. SINENSIS OSBECK ev. HUKUMOTOBENI), Ohmishima (C. SINENSIS OSBECK cv. OHMISHIMA), Shiroyanagi (C. SINENSIS OSBECK cv. SHIROYANAGI). Then each oil was separated into two fractions of hydrocarbon and oxygenated compound through a silica gel column. The aroma quality of each component in the fraction of oxygenated compounds having a characteristic aroma was determined by GC-profile, and then by sensory evaluation Octanal, nonanal, linalool, decanal, neral, geranial, dodecanal, Alpha and Beta sinensal were selected as the important volatiles for the navel aroma. The odour-unit and odour-contribution of each component in the fraction of oxygenated compounds were estimated on the basis of odour threshold and its concn. The result did not give enough

information for the odour quality, but a mutual relationship of 9 components mentioned above was found by factor analysis. To classify their aroma similarities among these four navel oranges, cluster analyses were performed on the basis of the data regarding to similarity by sensory test. Thus obtained classification (dendrogram) indicated that the similarity of odour quality of peel oil agreed well with that of the mixture of 9 compounds mentioned above. Furthermore, it is suggested that the dendrogram can be separated by the odour-contribution of decanal, dodecanal, terpenes and Beta sinensal, resp AS

Pears

- 1313 Moulding (PH), Goodfellow (J), McLellan (KM) and Robinson (DS). The occurrence of isoperoxidases in 'Conference' pears. *International Journal of Food Science and Technology* 24(3); 1989; 269-275

In this paper studies on the heat stability of peroxidase activity in pear peel and pulp extracts and the identification of a number of cationic and anionic iso-peroxidases by their isoelectric points are presented. As these pears are widely used in food industry to manufacture juice conc., spreads and in yoghurts need for data on the level and distribution of peroxidase activity in pears has been felt and hence these studies are carried out. Soluble and ionically-bound peroxidases have been obtained from the pulp and peel of 'Conference' pears. Results showed that the peel soluble fraction had the highest level of peroxidase activity and the peel peroxidases both soluble and ionically bound were heat stable. The percentage of heat inactivation of the pear peroxidases was found to be non linear against heating time and regeneration of enzyme activity was observed following heat inactivation. NGKR

CONFECTIONERY, STARCH AND SUGAR

- 1314 Ball (GFM). The application of HPLC to the determination of low molecular weight sugars and polyhydric alcohols in foods. A review. *Food Chemistry* 35(2); 1990; 117-152

HPLC methods for the detn. of individual low mol. wt. sugars (mono- to tetrasaccharides) and related polyhydric alcohols in foods are surveyed. Methods of sample preparation, detection and separation modes are discussed. Specific analytical procedures are tabulated according to sample type, sample preparation and HPLC conditions. AS

- 1315 Gey (M) and Muller (W). HPLC separations of mono- and oligomeric carbohydrates from biological materials by means of glass columns. *Die Nahrung* 32(7); 1988; 653-660

By means of HPLC mono- and oligomeric carbohydrates are separated on silica, modified chemically with aminopropyl groups or impregnated *in situ* with an amine modifier (piperazine). Fundamentals of this sugar analysis are self-packed glass columns. The advantages of these columns are high efficiencies and handy column plugs. They are chemically inert and can be packed in different length with different HPLC packings. Applications of HPLC technique using glass columns are demonstrated by way of qualitative and quantitative detn. of carbohydrates in different foodstuffs and in polysaccharides (e.g. starch, regenerated fibre), hydrolyzed under acid and enzymatic conditions. AS

- 1316 Tzouwara-Karayanni (SM) and Crouch (SR). Enzymatic determination of glucose, sucrose, and maltose in food samples by flow injection analysis. *Food Chemistry* 35(2); 1990; 109-116

Several sugars were determined in food samples with a flow injection system that used a combination of immobilized and soluble enzymes. The food samples were selected to have a broad range of sugar concn. (0.1-30%). The proposed method is more rapid than official methods, yet comparable results are obtained with the particular food samples studied. Because the method uses enzymatic reactions, it is more selective than standard, non-enzymatic procedures. The method has been applied to standard solutions of glucose, sucrose and maltose and to honey, wheat flour, white wine and a soft drink. The precision of the enzymatic method is 2% RSD. AS

Confectionery

Chocolates

- 1317 Hachiya (I), Koyano (T) and Sato (K). Seeding effects on solidification behaviour of cocoa butter and dark chocolate. I. Kinetics of solidification. II. physical properties of dark chocolate. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1757-1769

Rotational viscometer was used to study the effects of seeding of fat crystals. The seed cry stats used were cocoa butter, 1, 3-distearoyl-2-oleoyl glycol (SOS), 1,3-dibehenoyl-2-oleoyl glycerol (BOB) and 1,2,3-tristearoyl glycerol (SOS). Crystallisation kinetics of cocoa butter and dark chocolates were affected by three factors namely physical properties of the seed materials, thermodynamic stability and similarity in the crystal structure to cocoa butter. MNK

- 1318 Pangborn (RM), Guinard (JX) and Meiselman (HL). Evaluation of bitterness of caffeine in hot chocolate drink by category, graphic, and ratio scaling. *Journal of Sensory Studies* 4(1); 1989; 31-53

Perceived intensity of bitterness of caffeine (0.5 - 1.6g/100mL) and of quinine HCl (0.5 - 1.6 g/L) added to hot cocoa gave similar response distributions with concn. by category scales (CS) and magnitude estimation (ME). Using caffeine additives, CS and graphic analogue scales (GS) gave similar bitterness response functions. Parabolic functions provided the best fit between concn. and ratings for CS, GS and ME. The data demonstrated no difference for ME of bitterness intensity between free or fixed moduli. Hedonic responses also were not modified by whether the modulus was free or fixed, however, greater ME values were ascribed to lower concn. in the series when the reference was 4 g/L than when it was 2 g/L caffeine. CS intensity response distributions were similar between a series with a larger number of low levels versus and series with a larger number of high levels versus a series with a larger number of high levels across the same concn. range. The results indicate that ME may be inappropriate for scaling of degree of liking, independent of type of modulus. AS

Starches

- 1319 White (PJ), Abbas (IR) and Johnson (LA). Freeze-thaw stability and refrigerated-storage retrogradation of starches. *Starch/Starke* 41(5); 1989; 176-180

A method for the evaluation of freeze-thaw stability of starch gels described and compared with refrigerated-storage retrogradation. Differential scanning calorimetry (DSC) is used to estimate the energy required to break down recrystallized starch molecules after 10 cycles of freezing-thawing or after storage at 4 C for 1 wk. Different DSC properties were observed for different starches. Chemical modification decreased all DSC values for gelatinization except the gelatinization range of all modified starches examined. Rice and wheat starches displayed the lowest energies of gelatinization compared with other native starches studied. Most chemical modifications completely inhibited the recrystallization of starches during storage at 4 C or after 10 cycles of freeze-thaw. Mira-Cleer 340 (modified regular maize starch; hydroxypropyl distarch phosphate) had a slight recrystallization value. DSC endotherms for both recrystallization studies occurred at considerably lower temp. than those of the original gelatinization. AS

BAKERY PRODUCTS

Bread

- 1320 Ortola (C), Barber (B), Pelaez (MT) and Benedito de Barber (C). Storage of packaged white bread. *Revista de Agroquímica Y Tecnología de Alimentos* 29(3); 1989; 384-398 (Es).
- 1321 Rizk (IRS) and Ebeid (HM). Survival and growth of *Bacillus cereus* in Egyptian bread and its effect on bread staling. *Die Nahrung* 33(9); 1989; 839-844

Bread was made from dough previously inoculated with spores of three *Bacillus cereus* strains at different inoculation levels. Counts of survivors and bread staling were determined in bread during storage at 25 C. The total aerobic bacteria, sporeformer and *B. cereus* counts in seven different wheat flours were 3.0×10^6 to 9.1×10^7 , 3.2×10^5 to 1.5×10^6 and 50-100 colony forming units (CFU/g). About one in a thousand bacteria were found to survive baking. On the other hand, no multiplication took place, however, until the bread had been stored for more than 3 days. Also, survival and multiplication of *B. cereus* spores was shown to depend on the kind of strains and type of bread. The addition of *B. cereus* strains to the dough gave bread with higher freshness than the control samples. This was quite noticeable in inoculated pan bread during storage. It is possible to conclude from the results that *B. cereus* survive the baking process particularly if original contamination is high. Also increasing the freshness of the bread does not necessarily mean better ingredient and processing conditions. AS

MILK AND DAIRY PRODUCTS

- 1322 El-Gazzar (FE), Marth (EH) and Marth (Elmer (H). Loss of viability by *Listeria monocytogenes* in commercial bovine pepsin-rennet extract. *Journal of Dairy Science* 72(5); 1989; 1098-1102

Loss of viability by *Listeria monocytogenes* was studied in commercial bovin-pepsin rennets, survival was dependent upon the number of *L. monocytogenes* inoculated in the rennet. JSS

- 1323 Esteban (MA), Alcalá (M), Marcos (A) and Fernandez-Salguero (J). Comparision of methods for determination of high water activities. Application to dairy products and juices. *Food Chemistry* 35(2); 1990; 153-158

Water activity was determined in various dairy products

(ice creams, yoghurts, and flavoured milks) and several juices by three different methods: psychrometric, cryoscopic and gravimetric. The differences between the water activity values provided by the three methods were also calculated. Such differences were always smaller than 0.005 water activity units, which allows the use of a straightforward method (gravimetric) together with two instrumental methods (psychrometric and cryoscopic) for the detn. of high water activity values (in the range 0.999-0.900) in the aforesaid types of products. AS

- 1324 Wessels (D), Jooste (PJ) and Mostert (JF). Psychrotrophic, proteolytic and lipolytic properties of *Enterobacteriaceae* isolated from milk and dairy products. *International Journal of Food Microbiology* 9(1); 1989; 79-83

Most of the *Enterobacteriaceae* strains (73 out of 75) isolated in a previous study (Wessels et al., 1988) were psychrotrophic on agar plates, with the exception of *Enterobacter cloacae* strains. The *Enterobacteriaceae* strains were largely non-proteolytic on milk agar medium although limited numbers of *E. cloacae*, *Serratia rubidaea* and *Klebsiella oxytoca* strains were capable of proteolytic activity at 25 C. The *E. cloacae* and *K. oxytoca* strains positive at 25 C were also proteolytic at 7 C. Most of the sp. tested were non-lipolytic on Victoria blue butterfat agar. The majority of *Serratia marcescens* and *Klebsiella pneumoniae* strains and a minority of *E. cloacae* and *K. oxytoca* strains, however, were lipolytic on this medium. AS

Milk

- 1325 Brennand (CP), Kim Ha (J) and Lindsay (RC). Aroma properties and thresholds of some branched-chain and other minor volatile fatty acids occurring in milkfat and meat lipids. *Journal of Sensory Studies* 4(2); 1989; 105-120

Aroma properties of 23 branched-chain, odd-numbered, or unsaturated fatty acids which had each been dispersed in acidic aqueous media (pH 2.0) were evaluated. Aroma threshold values were determined using approx. 95 judges for assessing the presence of aromas over dilutions of each fatty acid. Qualitative aroma threshold values for individual fatty acids ranged from 0.006 to 82.4 p.p.m in the acidic solutions, and 4-ethyloctanoic acid exhibited the lowest threshold of the group tested. Qualitative aroma assessments of dilutions of each fatty acid showed a wide range of unique aroma properties. Fatty acids exhibiting branching at the 4-position had goaty/muttony/sheepy aroma notes as did other fatty acids containing 8-carbon chain structures. Cheese-like aromas were associated with the shorter branched-chain fatty acids. AS

- 1326 Calvo (MM) and A Olano (A). Formation of galactose during heat treatment of milk and model systems. *Journal of Dairy Research* 56(5); 1989; 737-740

The formation of galactose, lactulose and epilactose during heating of milk was studied. The concn. of these carbohydrates increased with pH and the severity of heat treatment. The presence of proteins reduced the amount of lactulose formed whereas it increased that of epilactose and galactose. The galactose in heated milks was derived from lactose degradation. Under the conditions studied, degradation of the Amadori rearrangement product did not result in the formation of galactose. The interaction between proteins and galactose increased the thermal stability of the monosaccharide. AS

- 1327 Chang (BS) and Mahoney (RR). Factors affecting the thermostability of beta-galactosidase (*Streptococcus salivarius* subsp. *Thermophilus*) in milk. A quantitative study. *Journal of Dairy Research* 56(5); 1989; 785-792

Enhanced stability of beta-galactosidase (*Streptococcus salivarius* subsp. *Thermophilus*) in milk is due to several milk components acting in concert. Milk salts stabilized the enzyme 3-fold compared to phosphate buffer. K^+ was a better stabilizer than Na^+ . Omission of divalent cations, especially Mg^{2+} caused a marked drop in stability. Lactose stabilized enzyme stored in the frozen state but destabilized enzyme stored unfrozen. Caseinate stabilized the enzyme 8-fold in phosphate buffer but it stabilized 144 fold in the presence of lactose. In the presence of milk proteins, lactose was 25 times as effective as galactose and 100 times as effective as glucose at promoting stability; sucrose slightly destabilized the enzyme. Stability rose with increasing lactose concn., but declined with increasing enzyme concn. In milk, soluble casein was the primary stabilizer; whey proteins and peptides had much less effect. Micellar casein had no effect on stability. AS

- 1328 Kim (SC) and Olson (NF). Production of methanethiol in milk fat-coated microcapsules containing *Brevibacterium linens* and methionine. *Journal of Dairy Research* 56(5); 1989; 79-811

Milk fat-coated microcapsules containing *BREVIBACTERIUM LINENS* and methionine were used to produce methanethiol, one of the volatile sulphur compounds implicated in Cheddar cheese flavour. Production of methanethiol from methionine occurred aerobically and anaerobically, but the production was 3- to 4-fold greater aerobically with most of the methanethiol being oxidized to dimethyl disulphide. About 35% of the total methanethiol was absorbed by the milk fat capsules and about

65% detected in the headspace. Levels of methanethiol began to decline at 26 C after 24 h in milk fat-coated microcapsules. However, low temp. such as 4 - 12 C, stabilized levels of methanethiol in microcapsules over an 8 d analysis period. Optimum pH and temp. for methanethiol production were 8 and 26 C resp. The antioxidants butylated hydroxytoluene, butylated hydroxyanisole and ascorbic acid had negligible effects on methanethiol production. AS

- 1329 May (SA), Mikolajcik (EM) Richter (ER). Conventional tube and microplate Limulus amoebocyte lysate procedures for determination of gram-negative bacteria in milk. *Journal of Dairy Science* 72(5); 1989; 1137-1141

- 1330 Mistry (VV). Thermal inactivation characteristics of alkaline phosphatase in ultrafiltered milk. *Journal of Dairy Science* 72(5); 1989; 1112-1117

Inactivation kinetics of alkaline phosphatase were studied in UF milk. Raw milk was used as a source of phosphatase. Inactivation was studied at 60 C for 20, 30 and 40 min., and 63 C for 10, 20 and 30 min. Lactose was found to increase heat resistance whereas proteins decreased it. JSS

- 1331 Scheduble (TL), Kondo (JK), Salih MA). Agglutination behaviour of lactic streptococci. *Journal of Dairy Science* 72(5); 1989; 1103-1111

This article present a rapid and sensitive live stained cell antigen plate assay for detecting starter agglutination using rose Bengal as a stain and bovine colostrum as a source of agglutinins. Bovine clostrum samples from the eighth postpartum milking contained significant levels of agglutinins. Radial immunodiffusion studies suggested that only very minute amounts of bovine immunoglobulins are involved in agglutination. The test appears to be useful to screen many strains for their relative potential to agglutinate. AS

- 1332 Shaikth (NA). Packaging and distribution system for liquid milk with special reference to bulk vending system. *Packaging India* 21(6); 1988; 22-26

Compared to other systems presently known, the above system can provide the consumers with quality milk at the lowest price. Traditional milk distribution, distribution in bottles, distribution in single service containers, distribution through FRP containers, bulk vending system, operation of the Buck vending system and economics are the aspects highlighted in this ariticle. SRA

- 1333 Singh (MP) and Jha (YK). Effect of soy milk supplementation on

coagulation of milk by microbial enzymes. **Beverage and Food World** 16(3); 1989; 27-29

Milk products

- 1334 Commerding (AM) and Doyle (MP). Evaluation of enrichment procedures for recovering *Listeria monocytogenes* from dairy products. **International Journal of Food Microbiology** 9(3); 1989; 249-268

Six different enrichment media and five selective plating media were compared for their suitability for the recovery of *Listeria monocytogenes* from dairy products. These included media used to test milk products by the US Food and Drug Administration (FDA) and the U.S. Centres for Disease Control (CDC), and media developed by the U.S. Department (USDA) for testing meat and poultry products. Test samples included naturally contaminated goat's milk, cultured milk products and ice cream manufactured with *L. monocytogenes* and unpasteurized milk inoculated with heat and freeze-injured cells of *L. monocytogenes*. Generally the media and two-stage enrichment protocol developed by the USDA, with plating of samples after two consecutive 24 h incubation periods, yielded better recoveries than all other enrichment media incubated for 24 h. A modified USDA procedure, incorporating non-selective pre-enrichment of samples by omitting acriflavine and nalidixic acid from the primary USDA enrichment broth, and transfer of a larger vol. of the initial culture broth to the secondary enrichment media, significantly increased recoveries of low numbers of sublethally stressed *L. monocytogenes*. Prolonged incubation of samples in the FDA enrichment both for 7 days did not consistently improve recoveries over the initial 24 h incubation time of the medium. The selective plating medium developed by the USDA, lithium chloride-phenylethanol-moxalactam agar, was the most effective plating agar for isolation of *L. monocytogenes* following enrichment of samples in any broth culture, and increased recoveries of *L. monocytogenes* by 19-40% compared with other selective agar media tested. AS

Cheese

- 1335 Christensen (TMIE), Kristiansen (KR) and Madsen (JS). Proteolysis in cheese investigated by high performance liquid chromatography. **Journal of Dairy Research** 56(5); 1989; 823-828

Reversed-phase HPLC was applied successfully to the study of proteolysis of α_{s1} - and beta-caseins during cheese ripening. Separation of α_{s1} , α_{s2} - and beta-casein in cheese on the Nucleosil d_{18} column was complete and resolution of casein and the α_{s1} -1- peptide was also obtained. This

made it possible to follow the first step in the breakdown of alpha₁ casein. However, beta- and gamma-casein were only partly separated by the method. UF-Havarti cheese were manufactured with bovine rennet or with microbial rennets from *Mucor miehei* or *Endothia parasitica*. The *M. miehei* rennet exhibited a stronger proteolytic activity than the other rennets towards alpha₁ casein. The activity of the *End. parasitica* rennet did not result in the formation of the alpha 1-peptide. Results indicate that much information about proteolysis in cheese can be achieved by means of liquid chromatography of their acid precipitates. MCV

- 1336 Martin-Hernandez (MC), Juarez (M). Retention of main and trace elements in four types of goat cheese. *Journal of Dairy Science* 72(5); 1989; 1092-1097

Retention of Na, Ca, Mg, P, Fe, Cu, Zn and Mn during coagulation and ripening was studied. Data on mineral elements is presented. JSS

- 1337 Pappes (C), Assimakopoulos (PA), OannidesKG), Pakou (G), AA) and Mantzios (AS). Processes that contribute to radiocesium decontamination of feta cheese. *Journal of Dairy Science* 72(5); 1989; 1081-1091

A series of exp. performed to study transfer of radiocesium from milk to feta-cheese. It indicated direct relationship with moisture content. In the second series of exp. radiocesium removal during brining indicated decrease in its concn. due to successive replacements of the storage medium. JSS

- 1338 Rauch (P), Hochel (I), Berankova (E) and Kas (J). Sandwich enzyme immunoassay of *Mucor miehei* proteinase (Fromase) in cheese. *Journal of Dairy Research* 56(5); 1989; 793-797

Sandwich enzyme immunoassay is another analytical method which has been found to be very specific and sensitive. This analytical approach was selected to develop a suitable method for the assessment of *Mucor miehei* proteinase (Fromase) in different types of cheese using horseradish peroxidase as a marker. The enzyme may be determined to a detection limit of 50 ng/ml. Slight cross reactions by chymosin, bovine, porcine and chicken pepsin did not affect the assay. Recovery of Fromase added to cheese extracts varied between 92 and 106%. It is possible to develop a procedure for the detn. of other proteinases used in cheese making which involves the principle of sandwich enzyme immunoassay. MCV

- 1339 Tzanetakis (N) and Litopoulou-Tzanetaki (E). Biochemical activities of *Pediococcus pentosaceus* isolates of dairy origin.

Journal of Dairy Science 72(4); 1989; 859-863

Eighty-three strains of pediococci were isolated from raw goat milk and Feta and Kaseri cheese and were characterized as *Pediococcus pentosaceus* (75 strains) and *P. pentosaceus* subspecies *intermedius* (8 strains). The hydrolases of 49 *P. pentosaceus* strains were examined with the API2YM system. Leucine aminopeptidase and valine aminopeptidase were the strongest activities found (means 4.98 and 4.92, resp., on a five-point colour intensity scale) and were found in all strains. Activities of beta-galactosidase and N-acetyl-beta-glucosamidase were found in 96 and 92% of the strains, resp., and were slightly weaker (mean activities of 4.61 and 4.17 resp.). Considerably lower were the activities of beta-glucosidase (mean 2.99) and phosphoamidase (mean 1.55) and were detected in 98 and 55% of the strains, resp. Very weak (<1) esterase, esterase:lipase, lipase phosphoamidase, cystine aminopeptidase, or acid phosphatase activities were found in various numbers of strains. These results give information about the biochemical activities of *P. pentosaceus* sp. found in milk and cheese. AS

Brick cheese

- 1340 Ryser (ET) and Marth (EH). Behaviour of *Listeria monocytogenes* during manufacture and ripening of brick cheese. *Journal of Dairy Science* 72(4); 1989; 838-853

Brick cheese was made by the washed curd procedure from pasteurized whole milk inoculated to contain ca. 1×10^2 to 1×10^3 *Listeria monocytogenes* (strain Scott A, Ohio V7, or California)/ml. Cheese were ripened (15 C/95% relative humidity) with a surface smear for 2, 3, or 4 wk to simulate production of mild, aged, or "Limburger-like" brick cheese, resp. and then stored an additional 20 to 22 wk at 10 C. Populations of strains Scott A, Ohio, V7, and California increased 1.89, 1.72, .83, and .86 orders of magnitude, resp., following completion of brining ca. 32 h after the start of cheese making. All four *L. monocytogenes* strains leached from cheese into brine during 24 h and survived in brine at 10 C at least 5 day after removal of cheese. Strains Scott A and Ohio grew rapidly during the initial 2 wk of smear development and attained max. populations of ca. 6.6 and 6.2, 7.0 and 6.9 and 5.6 and 5.1 $\log^{10}$ /g in 4- wk-old slice (pH 6.0 to 6.5), surface (pH 6.5 to 6.9), and interior (pH 5.6 to 6.2) samples of cheese, resp. Numbers of strains Scott A and Ohio generally decreased 1- to 7-fold during 20 to 22 wk at 10 C. Strains V7 and California failed to grow appreciably in any cheese during or after smear development, despite pH of 6.8 to 7.4 in fully ripened cheese; the strains were never isolated from 2- and 3- wk old cheese and with direct plating were detected

sporadically at levels generally lesser than or equal to 4.0 log₁₀ /g in cheese aged greater than or equal to 4 wk. Cold enrichment of slice, surface, and interior samples of cheeses aged greater than or equal to 4 wk generally yielded positive results for *L. monocytogenes*; strains V7 and California were detected in all cheese after 20 to 22 wk at 10 C. At 10 p.p.m., methyl sulphide, dimethyl disulphide, or methyl trisulphide (compounds commonly produced during ripening of brick and Limburger cheese) failed to inhibit appreciably growth of *L. monocytogenes*. AS

Cheddar cheese

- 1341 Litopoulou-Tzanetaki (E), Graham (DC) and Beyatli (Y). Detection of pediococci and other nonstarter organisms in American Cheddar cheese. *Journal of Dairy Science* 72(4); 1989; 854-858

Seventeen aging Cheddar cheese samples were examined for *Pediococcus* and other nonstarter culture organisms. Very few pediococci were found; of 71 isolates identified 4 were *Pediococcus* and 67 were *Lactobacillus*. All of the *Pediococcus* and 30 of the *Lactobacillus* isolates contained from one to four plasmids. Bacteriocin production was found in 55% of the *Lactobacillus* but in none of the *Pediococcus* isolates; this may have accounted for the paucity of *Pediococcus* in the cheese samples. AS

Cottage cheese

- 1342 Sims (GR), Glenister (DA), Brtocklehurst (TF) and Lund (BM). Survival and growth of food poisoning bacteria following inoculation into cottage cheese varieties. *International Journal of Food Microbiology* 9(3); 1989; 173-195

Following inoculation into cottage cheese var. with and without sorbic acid, obtained directly from the manufacturer, strains of enteropathogenic *Escherichia coli* and other *E. coli* survived but failed to multiply during storage at 7, 10 or 25 C. In the absence of sorbic acid spoilage due to *Pseudomonas fluorescens* occurred after storage for 5-13 days at 7 or 10 C and 1-2 days at 25 C *Salmonella enteritidis*, *S. huder*, *S. saint-paul*, *S. typhimurium* and *S. virchow* survived but failed to multiply at 10 C and in the case of most strains, at 20 or 25 C. *S. typhimurium* multiplied 100 fold in one batch of cottage cheese with peppers and onion in the absence of sorbic acid during storage at 25 C for 2 days; spoilage of this batch occurred due to yeasts or yeasts and moulds after storage for 4-8 days at 10 C and 0-2 days at 20 or 25 C. Following inoculation into cottage cheese var. prepared in the lab. and

which did not contain sorbic acid declined during storage at 10 and 20 C, the numbers of *Bacillus cereus* and *S. typhimurium* increased at both temp., and the numbers of *Yersinia enterocolitica* increased at 10 C, but declined at 20 C. Spoilage occurred due to the growth of moulds and *P. fluorescens* after storage for 5-14 days at 10 C, and due to *P. fluorescens* after storage for up to 2 days at 20 C. In products inoculated in a similar way but which contained sorbic acid (500-530 mg/kg), the numbers of *S. aureus* and *B. cereus* declined and in most products the numbers of *S. typhimurium* and *Y. enterocolitica* remained constant. In cottage cheese with chicken, however, the numbers of *Y. enterocolitica* increased 100-fold during storage of the product of 14 days at 10 C and the numbers of *S. typhimurium* increased 100-fold during storage for 2 days at 20 C. Spoilage of this product due to *P. fluorescens* occurred after storage for 8-14 days at 10 C, but was not evident at 20 C after 2 days. AS

Wheys

- 1343 Kanno (C). Purification and separation of multiple forms of lactophorin from bovine milk whey and their immunological and electrophoretic properties. *Journal of Dairy Science* 72(4); 1989; 883-891

Lactophorin is designated as a glycoprotein, which is present in bovine milk whey and reacts to the antiserum of the soluble glycoprotein of bovine milk fat globule membrane. The lactophorin was purified by DEAE-cellulose (pH 7.7), Sephadex G-100 and then Bio Gel A 15m from the component-3 fraction of the proteose-peptone fraction of bovine milk whey. The purified lactophorin was separated into seven components by DEAE-cellulose chromatography at pH 8.6. The seven components (LP-1 to 7) of lactophorin were almost homogeneous, but the respective bands were somewhat broad and varied in mobilities on disc electrophoresis. The seven lactophorin components used completely to the antisoluble glycoprotein of milk fat globule membrane on double immunodiffusion but showed different mobilities of precipitation lines on immunoelectrophoresis. The results indicated that lactophorin consisted of multiple forms, but had a common set of antigenic determinant groups against antisoluble glycoprotein. AS

- 1344 Singh (K) and Neelakantan (S). Amino acid composition of yeast single cell protein grown on paneer whey. *Journal of Dairy Research* 56(5); 1989; 813-815

The biological transformation of whey is of considerable importance owing to its high lactose content and the stringent legislation concerning disposal of dairy effluents. Lactose-fermenting yeasts have been used successfully for whey

fermentation. The present study describes the amino acid profile of three strains of yeast-*Candida pseudotropicalis*, *Kluyveromyces fragilis* and *Saccharomyces fragilis* grown on fermented clarified paneer whey substrate. Results suggested that fermentation of the by-product whey with these yeast strains, particularly suggested that fermentation of the by-product whey with these yeast strains, particularly *Sac. fragilis* and *K. fragilis* would result in a nutritively useful product. MCV

Whey proteins

- 1345 Hsu (K-H) and Fennema (O). Changes in the functionality of dry whey protein concentrate during storage. *Journal of Dairy Science* 72(4); 1989; 829-837

Various functional properties (protein solubility, foam stability, emulsifying capability) and development of browning of dry whey protein concentrate (WPC) containing 52% protein were monitored during 6 month at temp. ranging from -40 C to 40 C and water activities ranging from .15 to .41. Of the product attributes studied, increases in browning were most important. Of the storage variables studied, storage temp. and time were most important and water activity was of secondary importance. To achieve good retention of the initial attributes of WPC during 6 month storage, the temp. should be no higher than 20 C and the water activity should not exceed about 2. AS

Yoghurts

- 1346 Marranzini (PM), Schmidt (RH), Shireman (RB), Marshal (MR) and Cornell (JA). Effect of threonine and glycine concentrations on threonine aldolase activity of yoghurt microorganisms during growth in a modified milk prepared by ultrafiltration. *Journal of Dairy Science* 72(5); 1989; 1142-1148

Concn. of glycine and threonine did not effect growth of *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. There was no increase in titratable acidity with the increase in the concn. of glycine or threonine. However more acetaldehyde and threonine aldolase activity with the increased concn. of glycine and threonine resp. JSS

Milk proteins

Caseins

- 1347 Moon (TW), Peng (IC) and Lonergan (DA). Functional properties of cryocasein. *Journal of Dairy Science* 72(4); 1989; 815-828

Functional properties of casein isolated by UF and cryodestabilization as compared with commercial caseinates were assessed. Cryocasein was readily resuspended in water by the application of agitation and mild heat. Solubility profiles of cryocasein suggested a partial disintegration of micellar structure by the changes in pH and ionic strength. In spite of its resuspendibility, the emulsifying properties of cryocasein were not as good as those of commercial caseinates. Cryocasein retained the ability of native casein micelles in milk to form a curd upon rennet addition. It formed a firmer gel with a lower syneresis than sodium caseinate and calcium caseinate with added CaCl. AS

MEAT AND POULTRY

- 1348 Srikantha (S), Watabe (S) and Hashimoto (K). Comparative biochemistry of paramyosin. A review. *Journal of Food Biochemistry* 14(1); 1990; 61-88

The mol. wt., amino acid profile and immunological features of the paramyosins isolated from many invertebrate phyla are surveyed comparatively. In addition, the paramyosin literature reported predominantly from the investigations on bivalve molluscs (*Mercenaria* and *Mytilus* sp.) is reviewed under categories (1) microstructure, (2) solubility and stability characteristics, (3) phosphorylation, and (4) involvement in catch contraction. The importance of paramyosin to the quality of seafood systems has not been studied in detail so far. AS

Meat

- 1349 Reilly (WJ). The veterinary profession and meat hygiene. *British Food Journal* 91(8); 1989; 26-30

History of the profession is provided with description of its links with meat hygiene. Covers history, present situation, training, structure of veterinary services and future. SRA

- 1350 Sharma (N) and Keshri (RC). Programme of hygienic meat production in India. *Beverage and Food World* 16(3); 1989; 15-16

This presentation is an attempt to discuss the current situation of meat production and programmes initiated for production of wholesome meat in India. Covers briefly factors influencing wholesomeness, healthy meat animals, transport of meat animals abattoir condition and modernisation of abattoirs and salient recommendations. SRA

Beef

- 1351 Davey (KR). Theoretical analysis of two hot water cabinet systems for decontamination of sides of beef. *International Journal of Food Science and Technology* 24(3); 1989; 291-304
- 1352 Davey (KR) and Smith (MG). A laboratory evaluation of a novel hot water cabinet for the decontamination of sides of beef. *International Journal of Food Science and Technology* 24(3); 1989; 305-316
- 1353 Lanari (MC), Bevilacqua (AE) and Zaritzky (NE). Pigments modifications during freezing and frozen storage of packaged beef. *Journal of Food Process Engineering* 12(1); 1990; 49-66

Muscle pigment modifications during freezing and frozen of beef wrapped in high (polyethylene) and low (EVA/SARAN/EVA) gaseous permeability films were analyzed. Myo (Mb), oxy Mbo₂ and metmyoglobin (MetMb) concn. were determined using reflectance spectrophotometry. Results indicated that in polyethylene wrapped samples myoglobin oxygenation took place during freezing and only reaction observed throughout frozen storage was MetMb production from Mbo₂. Autoxidation was interpreted as a first order kinetic reaction. Storage temp. effect on kinetic and equilibrium constants was analysed; reaction enthalpy and activation energy were calculated. mbo₂ and MetMb production during beef oxygenation was represented as a consecutive first order reaction system determining previous vacuum storage time and temp. influence on oxygenation capacity. Vacuum packaging of frozen beef increased colour stability maintaining MetMb concn. levels lower than those corresponding to just frozen samples wrapped in polyethylene.

AS

Pork

- 1354 Liberski (DA). Bacteriological examination of chilled, used canned pork hams and shoulder using a conventional microbiological technique and the DEFT method. *International Journal of Food Microbiology* 10(1); 1990; 19-22

Products

- 1355 Komandi (K) and Dworschak (E). Measurement of some antinutritive factors in meat products containing texturated vegetable protein (TVP). *Die Nahrung* 32(7); 1988; 643-648

The alpha-(1,6)-galactosyl oligosaccharide and phytic acid contents of sausages containing TVP were examined. The results show how the meat industrial technologies affect the oligosaccharide and phytic acid contents of the end-products.

According to these experiences, the small quantities present in the end-products are not considered to be harmful to health but may show unexpected effects when compared to traditional products. With the knowledge of the concn. of the measured oligosaccharides phytic acid, after adequate calibration, the real TVP content of the finish-product can be determined according to the method elaborated by the authors. AS

Goshtaba

- 1356 Samoon (AH) and Sharma (N). Processing and preservation of 'Goshtaba'. A popular meat product of Kashmir. **Beverage and Food World** 16(3); 1989; 31-34

This article outlines briefly the historical origin, current status, processing technology, recipe, cooking yields and nutritive value of 'goshtaba'-a popular emulsion type processed meat product of Kashmiri 'Wazawan'. 'Goshtaba' has high nutritive value, high cooking yields and a highly appealing blend of curd and meat flavour and other palatability characteristics. 'Goshtaba' samples refrigerated in LDPE bags at 4 plus or minus 1 C were safe consumption upto 7 days. However, organoleptic scores decreased due to oxidative rancidity of added mutton fat, as depicted by increase in TBA values, during storage, pH and total acidity values changed significantly. Overall aerobic plate counts remained low although counts increased during storage. AS

Sausages

- 1357 Korkeala (H), Alanko (T), Makela (P) and Lindroth (S). Shelf life of vacuum-packed cooked ring sausages at different chill temperatures. **International Journal of Food Microbiology** 9(3); 1989; 237-247
- 1358 Korkeala (H) and Makela (P). Characterization of lactic acid bacteria isolated from vacuum-packed cooked ring sausages. **International Journal of Food Microbiology** 9(1); 1989; 33-43

The bacterial populations of the surface layer and the centre of 15 spoiled vacuum-packed cooked ring sausages were characterized. About 95% of the total bacterial population in the surface layer and 55% at the centre were lactic acid bacteria. Another large bacterial group at the centre consisted of *Bacillus* spp. The lactic acid bacteria on the surface and at the centre were quite similar. A typical streptobacteria, i.e. homofermentative psychrotrophic lactobacilli, were a major group of lactic acid bacteria in the surface layer of the spoiled sausages. Three main homofermentative groups could be observed on the basis of different carbohydrate patterns. Heterofermentative lactic

acid bacteria belonged mainly to genus *Leuconostoc*. The proportion of leuconostocs in the spoiled sausages was also quite large. They could be divided into three main groups on the basis of different carbohydrate fermentation patterns. The lactic acid bacteria population of spoiled cooked ring sausages thus seemed to be heterogeneous. The strains isolated resembled strains observed by other workers in meat and meat products. AS

Poultry

Chickens

Broilers

- 1359 Asghar (A), Lin (CF), Gray (JI), Buckley (DJ), Booren (AM), Crackel (RL) and Flegal (CJ). Influence of oxidised dietary oil and antioxidant supplementation on membrane-bound lipid stability in broiler meat. *British Poultry Science* 30(4); 1989; 815-823

The effects of oxidised oil, dietary alpha-tocopherol and BHA/BHT-supplementation on the fatty acid comp. of mitochondrial, microsomal and soluble protein fractions of broiler muscles, and on their lability to metmyoglobin/hydrogen peroxide catalysed peroxidation were investigated. Oxidised oil in the broiler diets induced rapid oxidation of the membrane-bound lipids and decreased their stability towards metmyoglobin-hydrogen peroxide-catalysed peroxidation. Supplementation of the broiler diets with alpha-tocopherol increased the alpha-tocopherol concn. in the microsomal and soluble protein fractions of the dark meat as well as the soluble protein fraction of the white meat. This, in turn, stabilised the membrane-bound lipids against metmyoglobin/hydrogen peroxide-initiated peroxidative changes. AS

- 1360 Gregory (NG) and Wilkins (LJ). Effect of ventricular fibrillation at stunning and ineffective bleeding on carcass quality defects in broiler chickens. *British Poultry Science* 30(4); 1989; 825-829

This exp. was concerned with whether ineffective bleeding could exacerbate the incidence of haemorrhagic conditions in broiler carcasses, when ventricular fibrillation (VF) was induced at stunning. Broiler chickens were electrically stunned with 81 mA per bird and then allocated to three treatments. About 67% experienced a VF at stunning and half of these birds

were bled out before processing while the other half were processed without being bled out. The birds which did not experience a VF at stunning were bled out before being processed. The carcasses were subjectively graded for haemorrhagic conditions. Inducing a VF at stunning caused increases in the incidence of red wingtips and haemorrhaging at the humerus-radius joint in the birds which were bled out. There were no other obvious effects of inducing a VF on carcass downgrading. Failure to bleed the chickens which had a VF at stunning resulted in high incidences of red wingtips, red necks, haemorrhaging at the humerus-radius joint and red sternal feather tracts. It was concluded that bleeding efficiency was important in influencing the expression of these characteristics when a VF occurred at stunning. AS

Poultry products

Eggs

Quail eggs

- 1361 Singh (RP), Panda (B) and Yadava (VK). Effect of packaging and storage on the keeping quality of pickled quail eggs. *International Journal of Food Science and Technology* 24(3); 1989; 283-290

The feasibility of using hake surimi as a partial replacement of red meat in frankfurter-type sausages was examined. Sensory evaluation and objective instrumental methods were used to determine textural characteristics of the finished Frankfurters. Microbiological examinations were performed throughout the 20 days storage period. Surimi formulations containing 10% hake were little different in texture, flavour, colour and acceptability from conventional red meat products. AS

SEAFOODS

Fish

- 1362 Fernandez-Salguero (J), Alcals (M), Marcos (A), Esteban (MA), Cabezas (L) and Gomez (R). Determination of water activity of canned fish using gravimetric, hygrometric and psychrometric methods. *International Journal of Food Science and Technology* 24(3); 1989; 233-236

Comparative studies are carried out on the detn. of water activity of canned mackerels, tuna and sardine by this three different methods Viz. gravimetric and two instrumental. The

results showed that the water activity values as determined by the gravimetric method which involves very simple lab. apparatus were not only significantly different from the values obtained by the other two methods but also was found to be useful in determining high water activity values. NGKR

- 1363 Jorgensen (BR) and Huss (HH). Growth and activity of *Shewanella putrefaciens* isolated from spoiling fish. *International Journal of Food Microbiology* 9(1); 1989; 51-62

A total of 101 cultures of hydrogen sulphide-producing organisms isolated from spoiling cod was studied. All cultures were identified as *Shewanella putrefaciens*. Two groups were distinguished on the basis of pattern of trimethylamine oxide reduction determined by conductance measurement, generation time at 25 °C and salt tolerance. The *S. putrefaciens* cultures were further characterized in a number of model exp. in order to examine the spoilage activity under various conditions. A good correlation between bacterial counts, detection time in conductance measurements and production of trimethylamine and off-odour was found. There were no differences in spoilage potential between strains of *S. putrefaciens*, and neither initial level of inoculum or batch of cod used as substrate influenced the levels of bacterial count corresponding to a certain production of trimethylamine and off-odour. AS

- 1364 Nomoto (M), Ohno (T) and Ohashi (M). Determination of K value of canned fish meat. *Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)* 36(7); 1989; 578-582 (Ja).

The K values of canned fish meat, using a freshness meter, a kind of enzyme sensor, the accuracy of which was confirmed to be sufficient was determined. The K values of canned pink salmon were extremely high, but unusual flavour was not detected. The K values of canned mackerel were also high. Any enzyme inhibitors, which might be extracted from fish or can during autoclave treatment and induce the high K value when the enzyme reagent was applied, were not detected. From the results obtained, it was suggested that the unexpectedly high K values of canned fishes reflected the storage conditions of the raw materials. The freshness of the raw materials was also discussed on the basis of the values of IMP ratio calculated from $IMP(\%) = K(\%)$. AS

Albacore

- 1365 Aubourg (S), Perez-Martin (R) and Gallardo (JM). Stability of lipids of frozen albacore (*Thunnus alalunga*) during steam cooking. *International Journal of Food Science and Technology* 24(3); 1989; 341-345

In this paper the results of study on the effect of cooking on lipids of albacore, (*Thunnus alalunga*) first held on ice and then frozen and stored for 6 months at -18 C have been presented. Changes in the content of total lipids, sterols, fatty acids, phospholipids, and iodine and peroxide values showed that the lipids do not change on much cooking. Simple sensory tests for quality are indicated to confirm the absence of off-flavours. NGKR

Hakes

- 1366 Montero (P) and Borderias (AJ). Changes in hake muscle collagen during frozen storage due to seasonal effects. *International Journal of Refrigeration* 12(4); 1989; 220-223

The present study deals with alterations occurring in hake muscle collagen during frozen storage as a result of processing and seasonal influences. Salt and acid solubility and component distribution of collagen were measured to check the aggregation. The results indicate that aggregation is dependent on storage conditions but not on seasonal variations. Correlations between dimethylamine content and insoluble collagen fraction indicate that formaldehyde might be one of the causes of aggregations. AS

- 1367 Vareltzis (K), Zetou (F), Soultas (N) and Tsiaras (I). Use of hake (*Merluccius merluccius*) surimi in a frankfurter formulation. *International Journal of Food Science and Technology* 24(3); 1989; 227-281

In this paper the results of investigation on the feasibility of using hake surimi as a partial replacement of red meat in frankfurter type sausages are presented. The textural qualities of the finished frankfurters were examined by sensory and objective instrumental methods. During storage period of 20 days microbiological studies were done. The results showed that surimi formulations containing 10% hake were similar to conventional red meat products in texture, flavour, colour and acceptability. NGKR

Herrings

- 1368 Aksnes (A). Effect of proteinase inhibitors from potato on the quality of stored herring. *Journal of the Science of Food and Agriculture* 49(2); 1989; 225-234

Autolytic process are important factors in the deterioration of fish material. The effect of proteinase

inhibitors from potato tubers in inhibiting the proteolysis in stored, ground herring was studied. Using an extract from potato, which was found to contain inhibitors for trypsin, chymotrypsin, carboxypeptidase A and carboxypeptidase B, the autolysis as measured by TCA-soluble protein was profoundly decreased, as were the contents of free amino acids. The potato extract preserved the contents of total arginine, tyrosine and lysine in the samples of stored herring, and the levels of histamine, putrescine, tyramine and cadaverine were reduced. The addition of proteinase inhibitors gave a somewhat lower content of total volatile nitrogen, and the total viable count of bacteria was reduced to some extent. AS

Pates

- 1369 Shepherd (R), Wharf (SG) and Farleigh (CA). The effect of a surface coating of table salt of varying grain size on perceived saltiness and liking for pate. *International Journal of Food Science and Technology* 24(3); 1989; 333-340

Sardines

- 1370 Beltran (A), Pelaez (C) and Moral (A). Keeping quality of vacuum-packed smoked sardine fillets. Microbiological aspects. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 88(3); 1989; 232-236
- 1371 Endo (Y) and Fujimoto (K). Suppression of fishy odour in sardine meat. *Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)* 36(7); 1989; 563-568 (Ja).

Several approaches for suppressing fishy odour derived from oxidation products of lipids in sardine meat have been attempted. Fishy odour in sardine meat was weakened when its pH was neutralized by an addition of arginine and lysine. Antioxidants such as BHT and alpha-tocopherol could not suppress fishy odour, although they inhibited oxidation of oil in sardine meat during processing and heating. By sensory test, beta- and gamma-cyclodextrins suppressed considerably fishy odour, because they trapped the volatile compounds in sardine meat. In addition, suppressing activity for fishy odour was observed in several phenols (catechol, propyl gallate and pyrogallol) and flavones (catechin). Judging from headspace gas analysis, alcohol dehydrogenase and aldehyde dehydrogenase reduced aldehydes in a heated sardine meat homogenate, but they did not decrease fishy odour evaluated by sensory test. On the other hand, the extraction of oils with high pressure carbon dioxide which hardly caused protein denaturation, decreased the lipid content to 1/5 in sardine meat and remarkably improved its flavour. AS

PROTEIN FOODS

Infant foods

- 1372 Zapico (J), Melcon (B), Garcia (C) and Alvarez (A). Rheological behaviour of prepared baby food as related to temperature. *Revista de Agroquímica Y Tecnología de Alimentos* 29(3); 1989; 351-356 (Es).

Flow was characterized as well as the viscosity-temp. in prepared baby food samples after the time dependence was eliminated. Flow behaviours was plastic with yield stress decreasing as temp. increases. Apparent viscosity values were not only influenced by temp. but also by the previous shear rate. Activation energy values between 3.44 and 6.09 Kcal/g mol, are comparable with those for other food products by several authors. These values decreased as the previous gradient increased, indicating a lower effect of temp. on viscosity. Finally it is proposed that activation energy values of non-Newtonian food products should be obtained at intermediate shear rates ($> 200 \text{ s}^{-1}$). AS

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Beer

- 1373 Miller (R) and Galston (G). Rapid methods for the detection of yeast and *Lactobacillus* by ATP bioluminescence. *Journal of the Institute of Brewing* 95(5); 1989; 317-319

A simple and less expensive sterility test based on bioluminescence was developed for detection of yeast and lactic acid bacteria in packed beer samples. The beer samples were filtered through 0.45 μm membrane. The residue along with the membrane was incubated in broth containing apyrene. After incubation the membrane was transferred to sterile petridish and to that luciferin/luciferase was added. The luminescence was read in a luminometer counting chamber. By this method the normal and heat tressed beers could be analysed for their yeast and lactic acid bacteria within one day and 3 days resp. NGM

- 1374 Wittmann (R) and Eichner (K). Detection of Maillard products in malts, beers, and brewing couleours. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 188(3); 1989; 212-220 (De).

During the Maillard reaction, the reducing sugars first react with the free amino groups of the amino acids. With aldoses, 1-amino-1-deoxyketoses (ketose-amino acids, Amadori compounds) are the first stable intermediates to be formed. In malts ten different Amadori compounds could be determined that formed during the Kiln-drying of malt. Dependent on the Kiln-drying conditions, the different types of malt contain different amounts and proportions of these compounds. During the brewing process (mashing, mash wort cooking) about half of the Amadori compounds are decomposed, whereas during fermentation no changes can be observed. Therefore the amount and comp. of Amadori compounds detected in beer may indicate the type of malt used. During the production of brewing couleurs, ammonia or ammonium compounds react with sugars and deoxyfructosazines are formed. In brewing couleurs, relatively high amount of these pyrazine derivatives (2-6g/100g) could be found. An analytical method is described for the quantitative detn. of deoxyfructosazines, indicating an addition of brewing couleur to beer. AS

Worts

- 375 Amore (TD), Russell (I) and Stewart (GG). The effect of carbohydrate adjuncts on brewers wort fermentation by *Saccharomyces uvarum* (Carlsbergensis). *Journal of the Institute of Brewing* 95(5); 1989; 333-336

The uptake of sugars such as sucrose, glucose present in wort by the strain of *Saccharomyces uvarum* (Carlsbergensis) during fermentation and the concn. of these sugars in wort on the sensory qualities were studied. Using sucrose and fructose syrup as adjuncts improved fermentation characteristics and produced 1% more ethanol as compared to corn-starch as adjuncts. However higher concn. of sucrose and fructose syrup gave beers with offensive in taste and poor quality beer. When glucose, fructose and corn starch were employed as adjuncts, the glucose was taken up at a faster rate than fructose. The increase in glucose concn. in the wort also resulted in severe repression of maltose and maltotriose utilization with significant levels of these sugars remaining in the beer produced. NGM

- 1376 Sendra (JM), Carboners (JV), Gosalbes (MJ) and Todo (V). Determination of beta-glucan in wort and beer by its binding with calcofluor, using fluorometric flow-injection analysis method. *Journal of the Institute of Brewing* 95(5); 1989; 327-332

Non-alcoholic beverages

Coffee

- 1377 Abraham (SK). Inhibition of *in vivo* genotoxicity by coffee. *Food and Chemical Toxicology* 27(12); 1989; 787-792

The possible role of coffee in modulating the *in vivo* genotoxicity of the well established genotoxic chemicals, mitomycin C, cyclophosphamide, procarbazine and adriamycin, was evaluated. Coffee was administered orally to mice that received the genotoxic chemicals ip. Genotoxicity was assessed in the bone-marrow micronucleus test. Doses of coffee in the range 225 to 1125 mg (dry wt.)/kg body weight caused significant reductions in the *in vivo* genotoxicity of mitomycin C, cyclophosphamide and procarbazine but not adriamycin. The inhibitory effect was significant when the coffee was given about 2 hr before the genotoxin; there was a lesser effect was significant when the coffee was given together with the genotoxin but there was no inhibition when coffee was given 2-4 hr after the genotoxin. An exp. with mitomycin C demonstrated that the reduction in genotoxicity was dependent on the coffee dose. The inhibition of genotoxicity by coffee was observed in bone-marrow cells sampled 24, 48 or 68 hr after injecting cyclophosphamide. Freshly brewed coffee extract, standard instant coffee, decaffeinated instant coffee and freeze-dried home-brew coffee all exerted inhibitory effects. AS

- 1378 Dibert (K), Cros (E) and Andrieu (J). Solvent extraction of oil and chlorogenic acid from green coffee. Part I. Equilibrium data *Journal of Food Engineering* 10(1); 1989; 1-11

In this study solid-liquid equilibrium data for green coffee oil and chlorogenic acid as a function of mass ratio of ground coffee to solvent and temp. were obtained using hexane and methanol as solvents. It was seen that equilibrium yield and concn. were correlated with these operating variables. Distribution curves and solubility diagrams were established for the two systems. NGKR

- 1379 Flament (I). Coffee, cocoa and tea. *Food Reviews International* 5(3); 1989; 317-414

This review covers chemistry of odouriferous constituents of volatile part of the flavour (aroma), and general survey of the analytical studies conducted on flavours of coffee, cocoa, and tea with a chronological presentation of the identification work is consisted. A list of identified compounds mentions the year of their first discovery and reference of corresponding publication. Comments are given on the structure, the origin and the organoleptic properties of some characteristic constituents chosen arbitrarily among the ones occurring in coffee, cocoa and tea, three beverages are discussed on the

organoleptic characteristics on the basis of their distribution among the various functional classes. 507 references. SRA

- 1380 Tono (T), Fujita (S) and Kawabe (M). Determination of chlorogenic acid in coffee samples by differences spectral method and DEAE-toyopearl column chromatography. *Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)* 36(7); 1989; 587-591 (De).

Chlorogenic acid (CA) in coffee samples was analyzed by extracting phenolic substance with 0.01 M acetate buffer (pH 5) at 100 C. The recovery of CA in the solution was the same as that in alcohol extract obtained by the usual procedure. The recovery of CA determined by difference spectral method (DS) and DEAE Toyopearl column chromatography (DTC) was compared with total polyphenol (expressed as DS or DTC were almost equal, but about 10% lower than total polyphenol. In instant coffees, CA obtained by DS was slightly smaller than that of DTC. Total polyphenol was 3 to 4 times of CA determined by DS. AS

Fruit juices

Apple juices

- 1381 Bengtsson (E), Tragardh (G) and Hallstrom (B). Recovery and concentration of apple juice aroma compounds by pervaporation. *Journal of Food Engineering* 10(1); 1989; 65-71

This paper reports the results of exp. conducted in a pilot pervaporation plant to find out the methods for apple juice aroma compounds as these aroma analysis and identification is very complicated. A model solution containing 12 of the most important apple aroma compounds was used to simulate an apple juice. The compounds their concn., aroma values, boiling points, mol. wt. and retention times in the G.L.C. analysis were reported and three process alternatives were adopted for treating the model juice and only single exp. were done. Results showed that pervaporation is seen to be a very promising technique for the recovery and enrichment of aroma compounds in the fruit juice industry. It was also found that the use of low process temp. provides a very gentle treatment and an improved flavour compared with distillation involving thermal treatment. NGKR

Pear juices

- 1382 Ibarz (A), Casero Miguelsanz (R), Pagan(J). Non-enzymatic browning kinetics of pear juice concentrate stored at different temperatures. *Revista de Agroquímica Y Tecnología de Alimentos* 29(3); 1989; 407-414 (Es).

Non-enzymatic browning kinetics of concentrated pear juice stored was studied three temp. (5, 37 and 50 C). Order zero and order one kinetics were applied to obtain the best equation describing this type of deterioration. The Arrhenius theory was applied to obtain the kinetics constant of non-enzymatic browning for storage at room temp. Finally, experimental results of the juice browning stored at room temp. (25.6 C) were compared to those obtained theoretically from activation energy. AS

- 1383 Ibarz (A), Pagan (J), Gutierrez (J) and Vicente (M). Rheological properties of clarified pear juice concentrates. *Journal of Food Engineering* 10(1); 1989; 57-63

In this note the rheological behaviour of clarified and depectinized pear juice has been reported. It has been found that pear juices free from pectin and pulp behave as Newtonian liquids. The effect of temp. and concn. on the viscosity of these juices is examined. For this purpose the juices of different concn. were obtained by diluting 71 Brix juice. The effect of temp. was studied on ten different temp. between 5 and 60 C. An expression for the combined effect of temp. and concn. on the viscosity has been evolved. NGKR

Tea

- 1384 Owuor (PO), Wanyiera (JO), Njeru (EK), Munavu (RM) and Bhatt (BM). Comparison of chemical composition and quality changes due to withering methods in black tea manufacture. *Tropical Science* 29(3); 1989; 207-213

Maceration of tea immediately after plucking reduced theaflavins and caffeine contents, the flavour index and tasters' evaluation of made black teas. Moisture reduction immediately after plucking followed by maceration produced the worst teas. Storage of plucked teas without moisture losses for 16 h followed by either no moisture reduction, warm or cold air moisture reduction, had little adverse effect on tea quality. Immediate moisture reduction followed by withering for 16 h without moisture reduction before maceration produced inferior teas. Normal withering produced the best teas. For good tea quality, two-stage withering should be done by first storing leaf without moisture loss, then reducing moisture before maceration and not the reverse. AS

FATS AND OILS

Fats

Cocoa butter

- 1385 Chaiserl (S) and Dimick (PS). Lipid and hardness characteristics of cocoa butters from different geographic regions. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1771-1776

Twenty four commercially pressed cocoa butters and 39 lab. solvent extracted cocoa butters were evaluated for hardness characteristics using differential scanning calorimetry (DSC). MNK

Oils

- 1386 Attah (JC) and Ibemesi (JA). Solvent extraction of the oils of rubber, melon pumpkin and oilbean seeds. *Journal of the American Oil Chemist's Society* 67(1); 1990; 25-27

Solvents of differing dielectric constant were used to extract the seed oils under soxhlet conditions and were characterised by acid number, iodine value and colour intensity detn. MNK

- 1387 deMan (L), deMan (JM) and Blackman (B). Polymorphic behaviour of some fully hydrogenated oils and their mixtures with liquid oil. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1777-1780

Fully hydrogenated soybean oil, beef fat, rapeseed oil, a rapeseed, palm and soybean oil blend, cottonseed oil and palm oil were characterized by fatty acid comp., glyceride carbon number and partial glyceride content, as well as melting and crystallization properties. The latter were established by differential scanning calorimetry. Polymorphic behaviour was analyzed by X-ray diffraction of the products in the flake or granulated form and when freshly crystallized from a melt. The hard fats were dissolved in canola oil at levels of 20, 50 and 80% and crystallized from the melt. Palm oil had the lowest crystallization temp. and the lowest melting temp.; rapeseed had the highest crystallization temp. and soybean the highest melting temp. All of the hard fats crystallized initially in the alpha-form. When diluted with canola oil, only palm oil was able to maintain beta-stability. AS

- 388 Fourie (PC) and Basson (DS). Application of a rapid transesterification method for identification of individual fatty acids by gas chromatography on three different nut oils. *Journal of the American Oil Chemist's Society* 67(1); 1990; 18-20

The lack of uniformity of analytical techniques employed for quantification of fatty acids led to the successful implementation of a rapid transesterification method using tetramethylammonium hydroxide to determine and compare the total fatty acid content of almond, pecan and macadamia oils. Palmitic, and linoleic acid comprised the largest part of the total fatty acid content in almond and pecan oils. Although oleic acid was also the main constituent of macadamia oils, its concn. was substantially lower than in the other oils. AS

- 1389 Keurentjes (JTF), Bosklopper (TJ), Van Dorp (LJ) and Van Riet (K). The removal of metals from edible oil by a membrane extraction procedure. *Journal of the American Oil Chemist's Society* 67(1); 1990; 28-32

In this study a hollow fiber membrane extraction system for the removal of metals from an oil is presented. Several extraction liquids were tested, of which an ammonia solution gives the best distribution coeff. ($m = 11.7$). From mass transfer calculations it follows that the resistance to mass transfer in the extraction phase in the fiber wall can be neglected compared to the resistances in the oil phase inside the fibers and the extraction phase outside the fibers. A cost evaluation shows that such a membrane extraction can be profitable in conventional refining if more than 1.5% bleaching earth has to be added in surplus to remove metals. AS

- 1390 Kuroda (Z) and Young (C). An edible oil deodourizer with a direct-fired heater. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1781-1783

Engineers have long believed a direct-fired heater (DFH) for deodourization is always in danger of over-heating. Commercial tests done in recent yrs have proved this danger can be avoided by proper furnace design. At least ten commercial deodourizers with this system are now used in Asia. A new deodourizer with a DFH was designed and built in 1986 in Taiwan. It features a single-shell design and steam-stripping of deep oil layers. It has been operated successfully for several yrs. The deodourized oil was compared with oil produced by conventional deodourizers. The new deodourizer with a DFH revealed several advantages. AS

Rapeseed oils

- 1391 Koseoglu (SS) and Lusas (EW). Recent advances in canola oil hydrogenations. *Journal of the American Oil Chemist's Society* 67(1); 1990; 39-47

Effects of temp., pressure catalyst concn. and catalyst preparation procedure on the hydrogenation rate, selectivity,

catalyst life and quality of oil were examined and compared with that of commercial nickel catalysts. MNK

- 1392 Yap (PH), deMan (JM) and deMan (L). Polymorphic stability of hydrogenated canola oil as affected by addition of palm oil. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1784-1791

Palm oil was added to canola oil before and after hydrogenation and the effect of this addition on the polymorphic stability of the hydrogenated oils was investigated. Palm oil was added to canola oil at two levels to produce hydrogenated canola and palm oil blends containing 5 and 10% palm oil. The levels of palm oil added to hydrogenated canola oil were 5, 10 and 15%. Samples were subjected to temp. cycling between 5 and 20 C as well as storage at 5 C up to 56 days. X-ray diffraction and polarized light microscopy were used to follow the changes of polymorphic form and crystal growth, resp., during cycling and storage. The beta-crystal contents of the oils were quantified based on the relative density of the characteristic short spacings using a Soft Laser Scanning Densitometer. The delaying effect of palm oil on phase transition was observed using Differential Scanning Calorimetry. Palm oil showed no effect on the polymorphic stability of the temp. cycled selectively hydrogenated oil, however, it delayed the transition rate at a constant temp. of 5 C. Addition of palm oil at the 10% level before hydrogenation and the level after hydrogenation proved to be effective in delaying polymorphic instability of non-selectively hydrogenated canola oil. The beta-stabilization effect of palm oil and the polymorphic stability of hydrogenated canola oil is most likely due to a decrease of fatty acid chain length uniformity. AS

- 1393 Yap (PH), deMan (JM) and deMan (L). Crystallization characteristics of hydrogenated canola oil as affected by addition of palm oil. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1792-1795

Addition of palm oil at levels at 5, 10 and 15% to selectively and non-selectively hydrogenated canola oil increased the time of isothermal crystallization at 20 C and delayed the appearance of the isothermal crystallization peak as determined by DSC. The degree of supercooling was also increased. Addition of palm oil to canola oil before selective or non-selective hydrogenation decreased the time of the appearance of the isothermal crystallization peak. Rates of crystallization were determined in selectively hydrogenated canola palm oil mixtures which followed first order kinetics. AS

Rice bran oils

- 1394 Bhattacharyya (S) and Bhattacharya (DK). Biorefining of high acid rice bran oil. *Journal of the American Oil Chemist's Society* 66(12); 1989; 1809-1811

Rice bran oil with a high free fatty acid contents (FFA) after degumming and dewaxing can be converted into edible quality oil of satisfactory refining characteristics by first adopting the biorefining process to reduce the major portion of the FFA by converting them into neutral glycerides with the aid of 1,3 specific lipase under optimum conditions and later deacidifying the residual FFA of the biorefined oil by alkali neutralization. AS

- 1395 El-Zanati (EM) and Zaher (FA). Utilization of rice bran oil to produce an antifoamer. *Journal of the American Oil Chemist's Society* 67(1); 1990; 61-63

Crude rice bran oil was dewaxed by chilling to 17 C, followed by centrifuging. The wax sludge obtained was 68% free fatty acids and 32% waxes, whereas the oil phase was 65.65% fatty acids and 34.35% glycerides. The dewaxed oil was evaluated as an antifoaming agent for aqueous media and compared to commercial oleic acid. It was thought that dewaxed rice bran oil has an antifoaming power greater than oleic acid, especially when used in small proportions. Dewaxed rice bran oil was also applied to break and control the foam formation in a phosphoric acid production unit. AS

Soybean oils

- 1396 Endo (Y), Chiba (J), Fujimoto (K) and Kaneda (T). Effects of minor components on flavour reversion in soybean oil. *Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)* 36(8); 1989; 682-684

The effects of minor components in soybean oil on flavour reversion were investigated for understanding the mechanism of flavour reversion in soybean oil. Refined soybean oil was fractionated by silicic acid column chromatography. Isolated, minor components were added to soybean oil triglyceride and the mixtures were oxidized under a fluorescent lamp irradiation. Results indicate that precursors or inducers are present in the minor components eluting with diethyl ether/n-hexane (1:1) on silicic acid column chromatography. However, di- and mono-glycerides together with sterols, the main components of the diethyl ether/n-hexane (1:1) fraction, were found not to be responsible for flavour reversion in soybean oil, although they reduced the flavour stability of rapeseed and corn oils. AS

- 1397 Moulton (KJ) and Mounts (TL). Continuous ultrasonic degumming of crude soybean oil. *Journal of the American Oil Chemist's Society* 67(1); 1990; 33-38

Ultrasonic energy has been applied to continuous degumming for the efficient removal of phospholipids from crude soybean oil. The crude oil and water (2.0% by wt.) were pumped through an ultrasonic processing cell, oil and hydrated gums were separated by centrifugation, and the recovered oil was vacuum bleached. The degummed and bleached oil had a residual phosphorus content of less than 10 p.p.m. and was subsequently deacidified-deodourized in all-glass lab. deodourization equipment. Odour and flavour evaluation indicated that the salad oil produced by the process of ultrasonic degumming/deodourization was equivalent in quality and stability to a conventionally processed salad oil. AS

- 1398 Proctor (A) and Palaniappan (S). Adsorption of soy oil free fatty acids by rice hull ash. *Journal of the American Oil Chemist's Society* 67(1); 1990; 15-17

Studies demonstrated that free fatty acids can be adsorbed from a soybean oil/hexane miscella by inorganic rice hull ash. A 1% dose was effective in diminishing free fatty acid concn. but acid activation reduced the adsorption. Binding of free fatty acids followed a Freundlich isotherm with smaller doses of ash adsorbing more efficiently. Addition of isopropanol to the miscella promoted the adsorption, while water deactivation of the ash had no effect, possibly because water occupied sites not accessible to free fatty acids. Impaired adsorption behaviours of ash heated above 70 C could have been due to disruption of the crystal form. The adsorption behaviour of rice hull ash may be more fully understood with a better knowledge of adsorbent structure. AS

SPICES AND CONDIMENTS

Chillies

- 1399 Malchev (E), Tanchev (S), Ioncheva (N) and Kalpakchieva (K). Changes in carotenoids during the storage of red pepper powder obtained by drying of red pepper paste. *Die Nahrung* 33(9); 1989; 799-803

The effect of the drying temp. on the changes in the total carotenoids during the storage of red pepper powder obtained by drying of red pepper pulp in spray- and air-fountain dryers has been investigated. The effect of the drying temp. on the rate constants of degradation of 4 main carotenoids (capsorubin,

capsanthin, zeaxanthin and beta-carotene) has been studied, too. The rate of degradation of the above mentioned carotenoids was found to be higher at more elevated drying temp. The rate constants of degradation of the carotenoid during the storage of red pepper powder were higher when using spray dryers than those occurring in red pepper powder obtained by drying in air-fountain dryers. AS

Chillies

- 1400 Ogbadu (GH), Alina (MA) and Olarewaju (JD). Total capsaicinoid content of some *Capsicum* species grown in Northern Nigeria. *Tropical Science* 29(3); 1989; 151-155

The total capsaicinoid content of fruits of *Capsicum frutescens* L. were determined spectrophotometrically. The *C. frutescens* var. had capsaicinoids ranging from 21.7-119.7 mg/100g for unripe and 33.7-266.5 mg/100g for ripe, fresh fruits. The *C. annum* var. had capsaicinoids ranging from 0.0 28.4 mg/100g for unripe and 0.0 107.2 mg/100g for ripe, fresh fruits. Total capsaicinoids increased from the unripe to the ripe stage. The flesh of the ripe fruits had a higher content (25.3-391.2 mg/100g fresh) than the seeds 3.1-70.2 mg/100 g fresh seeds) in the two var. The var., size and stage of maturity of the fruits influenced the amount of capsaicinoids present. AS

Garlic

- 1401 Decio (P). The garlic market. Analysis and new prospects. *Industrie Alimentari* 28(274); 1989; 799-805 (It).

SENSORY EVALUATION

- 1402 Bertuccioli (M). The role of sensory evaluation in food industry. *Industrie Alimentari* 28(274); 1989; 811-814 (It).
- 1403 Costell (E), Damasio (MH), Izquierodi (L) and Duran (L). Selection of a sensory panel for descriptive analysis of non-oral texture of hydrocolloids gels. *Revista de Agroquímica Y Tecnología de Alimentos* 29(3); 1989; 375-383 (Es).

A sensory panel was selected to describe modifications in non-oral texture of carrageenan-carob bean gum-guar gum gels produced by changes in comp. Intensity of 10 attributes were evaluated by 11 preselected panelists on gels of different comp. using 10 cm semistructured scales. Anova study of data gave adequate information on discriminant ability and reproducibility of each candidate for each attribute. Monova

analysis was shown to be more appropriate for the evaluation of agreement within the panel. Information provided by both methods for final selection of panel is discussed. AS

- 1404 Yubjev (VP), Likhodzievskaya (I B), Zasypkin (DV), Alekseev (VV), Grinberg (VYA), Polyakov (VI) and Tolstoguzov (VB). Investigation of the microstructure of textured proteins produced by thermoplastic extrusion. *Die Nahrung* 33(9); 1989; 823-830

Optical microscopy and pulsed nuclear magnetic resonance were used to get insight into the microstructure of textured products based on soy protein isolate and its mixtures with some other proteins and with polysaccharides. It is shown that textured products based on polymer mixtures exhibit a more pronounced anisotropy and contain more microinhomogeneities than those based solely on soy protein isolate. It is thought that the mechanism of creation of the structure in the thermoplastic extrusion process relies on the phenomenon of limited thermodynamic compatibility. AS

FOOD STORAGE

- 1405 McGaughey (WH) and Akins (RG). Application of modified atmospheres in farm grain storage bins. *Journal of Stored Products Research* 25(4); 1989; 201-210

The use of a modified atm. for fumigation of circular, corrugated steel farm grain storage bins was investigated. The bins were 4.6 m diameter and filled to a depth of 1.5 m with wheat. Details of the concn. histories during purge with the modified atm. are given, and data on the effect of gas flow rate during maintenance is also provided. Comparisons were made between bins with and without drying floors, as well as between bins which were unsealed, those which were wet sealed, and those which were sealed by using a plastic film over the grain surface. It was found that satisfactory concn. could be achieved using purge rates which produce superficial linear velocities above 30cm/h. At these rates, the gas vol. required to purge the air from the grain is equivalent to the space occupied by the grain bulk (and its interstitial space). After purging, the concn. may be successfully maintained by a gas rate producing a velocity of 3 cm/h if a surface covering is used. A surface covering reduced gas maintenance requirements by a factor of 10 compared to that for a ventilated overhead space and by a factor of 2 compared to completely sealing the overhead space. AS

INFESTATION CONTROL AND PESTICIDES

- 1406 Abdel-Salam (KA). Gamma irradiation effects on mating competitiveness of *Tribolium castaneum* (Herbst). *International Journal of Food Science and Technology* 10(1); 1989; 35-42

When males of *Tribolium castaneum* (Herbst) substerilized with 35, 40 or 50 Gy of gamma-irradiation (I) were added to untreated (U) pairs of adults at I:U ratios of 1:1, 2:1 and 5:1, the percentage of hatched eggs was increased by increasing the dose administered to males, as not expected, at equal flooding ratio. The calculated degree of competitiveness showed that males irradiated with the lowest dose (35 Gy) were more competitive than males irradiated with the highest dose (50 Gy). However, increasing the ratio of irradiated males and females with 50 Gy to 10 or 20 increased, accordingly, the competitiveness value. The results also indicate that if an equal number of irradiated males and females with 50 Gy, which had given 99.16% sterility, were placed with untreated pairs of adults at different ratios (1:1, 5:1, 10:1, and 20:1), the effectiveness was more promising. Moreover the data further suggest that the effectiveness was enhanced when the ratio of irradiated males and females was increased. Thus, the presence of sterile females along with sterile males in the stored products appears to dilute the effectiveness of normal males, which otherwise would mate with normal females. AS

- 1407 Qasimj Chaudhry (M), Ahmed (H) and Anwar (B). Development of an airtight polyethylene enclosure for integrated pest management of grains, stored at farm level in Pakistan. *Tropical Science* 29(3); 1989; 177-187

Tubular polyethylene was shaped into a gastight enclosure for the disinfestation of a max. of ten gunny bags of grain (about one metric tonne), through phosphine fumigation. The enclosure also served as a physical barrier against reinfestation during subsequent storage. The enclosure, made of low density polyethylene of 0.2 mm thickness, could retain a lethal concn. of phosphine for more than 7 days, using a single, 3.0 g ALP tablet, provided that it was in the shade and protected from wind action. When the enclosure was tested outdoors and exposed to the sun, there was a significantly higher loss of gas. Similarly, the loss of gas was increased when puffs of wind were applied to the enclosure. The rate of loss of gas was the highest when enclosure was simultaneously exposed to both sun and wind. AS

Insects

Cryptolestes terrugineus

- 1408 Cox (PD), Parish (WE) and Beirne (MA). Variations in the refuge-seeking behaviour of four strains of *Cryptolestes ferrugineus* (Stephens) (Coleoptera: Cucujidae) at different temperatures. *Journal of Stored Products Research* 25(4); 1989; 239-242

The refuge-seeking behaviour of insecticide resistant and susceptible strains of *Cryptolestes ferrugineus* (Stephens) was investigated in the lab. by containing adults in areas containing a refuge filled with wheat. Three strains had been collected from grain stores and mills, and the fourth (Insectary) had been reared in constant conditions for over 25 yrs. The effect of temp. on behaviour, in the range 15-30 C, was also examined. The Insectary strain was particularly affected by low temp. with far fewer adults being recorded in the refuge at the end of the 2-week test period compared to other strains. Differences in refuge-seeking behaviour between strains increased with decreasing temp., and were greatest below 20 C; this corresponds with the temp. at which grain is usually stored in Britain and in other countries of temp. climate. These differences in behaviour appear to be unconnected with the biochemical/ physiological resistance of the strains to malathion. AS

Sitophilus zeamais

- 1409 Don-Pedro (KN). Mechanisms of action of some vegetable oils against *Sitophilus zeamais* Motsch (Coleoptera: Curculionidae) on wheat. *Journal of Stored Products Research* 25(4); 1989; 217-223

Pesticides

Azadirachta indica

- 1410 Makanjuola (WA). Evaluation of extracts of neem (*Azadirachta indica*. juss) for the control of some stored product pests. *Journal of Stored Products Research* 25(4); 1989; 231-237

Lab. investigations on the activity of neem leaf and seed extracts in water or methylated spirit on *Callosobruchus maculatus*, *Sitophilus oryzae* and *Cylas puncticollis* were made at 27 Plus or minus 2 C and 65 plus or minus 5% r.h. Field trials were conducted to determine their effectiveness as protectants of cowpeas and maize in storage at 28 plus or minus 4 C and 82 plus or minus 7% r.h for 5 months. The results showed that the effectiveness of neem is affected by differences in insect behaviour. The extracts were more active

gas suppressants of *C. maculatus* than *Sitophilus* spp; there was no effect on *C. puncticollis*. All of the extracts tested resulted in a significant reduction in oviposition % egg hatch and % adult emergence in *C. maculatus* and in adult emergence of *Sitophilus*. Field trials showed that extracts mostly gave good protection to cowpea against *C. maculatus* for 5 months but only moderate protection to maize against *S. zeamais*. Seed extracts were more effective than leaf extracts. AS

BIOCHEMISTRY AND NUTRITION

Biochemistry

- 1411 Grinberg (VY), Danilenko (AN), Burova (TV) and Tolstoguzov (VB). Conformation stability of 11S globulins from seeds. *Journal of the Science of Food and Agriculture* 49(2); 1989; 235-248

The effect of pH, neutral salts and ethanol on the conformational stability of 11S globulins from some seeds have been investigated by the method of differential scanning microcalorimetry. For six proteins it has been shown that a molecule of 11S globulin may be regarded as an ensemble of 12 thermodynamically equivalent domains, which may possibly be identified with the constituent chains of this protein. As a first approximation the unfolding of each constituent chain may be considered as a transition between two states. The dependencies of the excess free energy of denaturation for 11S globulins on the pH, salt concn. and ethanol concn. have been obtained within the two-state model for protein unfolding. The nature of the above factors influences on the conformational stability of 11S globulins are discussed. AS

- 1412 Suchkov (VV), Grinberg (VY), Muschiolik (G), Schmandke (H) and Tolstoguzov (VB). Mechanical and functional properties of anisotropic geleous fibres obtained from the two-phase system of water casein- sodium alginate. *Die Nahrung* 32(7); 1988; 661-668

Mechanical properties of geleous fibres obtained from the liquid two-phase system of water - casein - sodium alginate have been studied in relation to the conditions of coagulation and the protein phase vol. fraction. Mechanical strength, moduli of elasticity and relaxation of the fibres have been shown to exhibit a linear dependence on the vol. fraction of the protein phase which can be accounted for by the anisotropic structure of the fibres obtained. These fibres can be referred

to as a continuous phase matrix filled with oriented microfilaments of quasi-infinite length that arise from the dispersed phase. Functional characteristics of fibres differing in terms of the protein phase content have been investigated along with organoleptic properties of nutritive comp. It has been established that artificial products based on two-phase fibres surpass those manufactured from monophasic ones with respect to organoleptic and technological properties. AS

Nutrition

- 1413 Agarwal (V) and Chauhan (BM). Effect of feeding some plant foods as source of dietary fibre on biological utilisation of diet in rats. **Qualitas Plantarum - Plants Foods for Human Nutrition** 39(2); 1989; 161-167

Isoproteinous diets containing 1% cholesterol and 10% fibre derived from plant foods namely, peepalbanti (*Ficus religiosa*), barbanti (*Ficus Bengalensis*), gullar (*Ficus glomerata*), teent (*Capparis decidua*) and khejri beans (*Prsopsis cineria*) or pure cellulose, were fed to rats for 40 days. Effect of incorporation of these whole plant parts on feed intake, wt. gain, feed efficiency ratio (FER), dry matter digestibility (DMD) and true protein digestibility (TPD) in weanling rats was studied. Their inclusion did not affect the wt. gain significantly whereas all other parameters were influenced to a varying extent. Foods rich in lignin had relatively lower FER, DMD and TPD whereas cellulose and pectin rich foods had higher DMD and TPD. AS

- 1414 Haenel (H). Phylogenesis and nutrition. **Die Nahrung** 33(9); 1989; 867-887

- 1415 Sugano (M). Recent advances in nutrition of lipids. **Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)** 36(7); 1989; 603-608 (Ja).

TOXICOLOGY

Bacteria

Aeromonas

- 1416 Fricker (CR) and Tompsett (S). *Aeromonas* spp. in foods. A significant cause of food poisoning? **International Journal of Food Microbiology** 9(1); 1989; 17-23

Aeromonas hydrophila

- 1417 Todd (LS), Hardy (JC), Stringer (MF) and Bartholomew (BA). Toxin production by strains of **Aeromonas hydrophila** grown in laboratory media and prawn puree. **International Journal of Food Microbiology** 9(3); 1989; 145-156

Toxin production by four strains of **Aeromonas hydrophila** grown at 30 and 37 C in two lab. media and prawn puree was studied. Three different cell lines were used to test for cytotoxic activity, haemolytic activity was tested against rabbit and guinea pig erythrocytes, proteolytic activity was assayed with azo-casein and enterotoxic activity using the suckling mouse assay. Results showed reduced cytotoxic and haemolytic activities in prawn puree compared with the two media, but in most cases increased proteolytic activity. No enterotoxic activity was observed in prawn puree although it was occasionally detectable in both lab. media. AS

Staphylococcus aureus

- 1418 Genigeorgis (CA). Present state of knowledge on staphylococcal intoxication. **International Journal of Food Microbiology** 9(4); 1989; 327-360

Globally, staphylococcal intoxication remains a very common food poisoning. In this review, emphasis is being placed on epidemiological aspects of the problem and the effect of food environment on the survival and growth of staphylococci and production of enterotoxins. The high prevalence of staphylococci in raw foods of animal origin requires effective processing for safety. Man remains a major reservoir for post-process recontamination. The effect of the intrinsic characteristics of foods (pH, water activity, E preservatives, competing microbial flora, natural food) and extrinsic parameters of processing and storage (temp. freezing, irradiation, dehydration, packaging, humidity) on staphylococcal survival, growth and enterotoxins production has been evaluated extensively. While staphylococci can be destroyed easily the enterotoxins can survive practically all food processing. While staphylococci can be destroyed easily the enterotoxins can survive practically all food processing. While extreme levels of intrinsic variables can control enterotoxin production, yet the environment of most foods is conducive to staphylococcal growth. Rapid food cooling, refrigeration and consumer, food handler and processor education remain the key to staphylococcal food poisoning prevention. AS

FOOD LAWS AND REGULATIONS

- 1419 Alkins (DP) and Smith (SM). Chemical safety of food. Maff's role. **British Food Journal** 91(8); 1989; 15-23

A description of the scientific basis of MAFF'S policy on the chemical safety of food is provided. Covers Pre-market evaluations in the UK (food additives, need, safety, veterinary medicines, pesticides), post-market monitoring in the UK (steering group on food surveillance, principles of surveillance, surveillance methodology, detailed information, use of surveillance data, and the UK food surveillance programme protecting the food supply). SRA

- 1420 Corbally (M). Food safety and food law reform. The environmental health view. **British Food Journal** 91(8); 1989; 24-25

- 1421 Kilcast (D). Implications of food irradiation for food safety. **British Food Journal** 91(8); 1989; 40-44

The irradiation process is outlined and possible applications are described. Also covers changes in food components, detection of irradiated food, current legislation, irradiation, food safety and consumer. SRA

GENERAL

- 1422 Abbott (H). Food product liability loss control. *British Food Journal* 91(7); 1989; 19-21

This article covers co-ordinating a strategy, product risk identification, product risk reduction, source of a product defect, product risk transfer, setting the conditions of the contract, and product risk retention. SRA

- 1423 Holmes (A). Food science and technology in the year 2000. *British Food Journal* 91(7); 1989; 3-6

Many subjects are covered, offering a personal view of the future of the food industry, highlights of the article are consumer demands, forecasting the future, consumers needs, meeting the consumers needs, meeting the companies needs and providing the technical resources. SRA

- 1424 McFarlane (L). In-line measurement of product quality for process control. *British Food Journal* 91(7); 1989; 7-10

A classification is introduced for sensor calibration, up keep and reliability. Covers ingredient handling, classification or sensor requirements, reliability and closed-loop control. SRA

- 1425 Mohamed (S), Abdullah (N) and Muthu (MK). Physical properties of **keropok** (fried crisps) in relation to the amylopectin content of the starch flours. *Journal of the Science of Food and Agriculture* 49(3); 1989; 369-377

The physical characteristics of **keropok** made from various flours (glutinous rice, rice, wheat, sago, tapioca and corn) were studied. The amount of water used to wet the flour in the initial stages of making the **keropok** was very important, since it affected the linear expansion, oil absorption, elasticity and crunchiness of the resultant fried crisps. Linear expansion, oil absorption and elasticity were positively correlated to the total amylopectin content in the whole flour ($r^2 = 0.99, 0.97, 0.97$ resp.). The best fitted lines for prediction of linear expansion, oil absorption and elasticity of the fried crisps were $21 y$ less than or equal to $0.35 x - 162$, $y = 0.15x - 74$ and $Y = 0.0008x - 0.41$ resp. where x is the amylopectin content of the whole flour. Good **keropok** can be made from any starch-rich flour that contains a high proportion of amylopectin. These starches can be recognised physically by their clarity on gelatinisation, stability to retrogradation, low resistance to shear and high

cold paste viscosity. The addition of mung bean flour to tapioca flour helped increase the protein content and flavour of the **keropok**; it also reduced the oil absorption of the **keropok** during frying. Although linear expansion decreased with increasing mung bean flour content, the substitution of up to 600 kg⁻¹ mung bean flour was acceptable since the linear expansion of mung bean/tapioca crisps remained above 35%. The experimental values for linear expansion of mung bean/tapioca crisps correlates very well ($r^2 = 0.99$) with the predicted linear expansion based on the amylopectin content of the combined flours. Legume crisps, being high in protein and fibre, are a possible cheap alternative to fish crisps for the production of a nutritious snack food for growing children. AS

FOOD PROCESSING

1426 Lightbody (MS). New technological approaches to reducing uniformity in processed foods. **British Food Journal** 91(7); 1989; 22-26

1427 Skudder (PJ). Ohmic heating in food processing. **ASEAN Food Journal** 4(4); 1989; 162-163

A novel heat treatment process has been developed for continuous aseptic processing of particulate food products as an alternative to scraped surface or tubular heat exchangers and in-can sterilization. This system can produce major improvements in structural, nutritional and organoleptic properties of foods. SRA

FOOD PACKAGING

1428 Ratna (A). Innovations in temper proof packaging and product security induction heat sealing. **Beverage and Food World** 16(2); 1989; 31-32

1429 Ross Tindale (C), Whitfield (FB), Levingston (SD) and Ly Nguyen (TH). Fungi isolated from packaging materials. Their role in the production of 2, 4, 6-trichloroanisole. **Journal of the Science of Food and Agriculture** 49(4); 1989; 437-447

Fungi isolated from fibreboard cartons, paper sacks and jute sacks were assessed for their ability to methylate 2,4,6-trichlorophenol in a defined, reduced-water-activity growth medium. When extracts of individual cultures were analysed by gas chromatography-multiple ion monitoring mass spectrometry.

17 of the 31 sp., initially selected by sensory techniques, were found to produce 2,4,6-trichloroanisole. Quantitative analyses showed that the most efficient methylators in the defined liquid medium were *Paecilomyces variotii*, *Fusarium oxysporum*, *Penicillium crustosum*, *Pen. citrinum*, *Pen. brevicom. pactum* and one strain of *Aspergillus flavus*. The role of these fungi in the production of 2,4,6-trichloroanisole in packaging materials contaminated with 2,4-6-trichlorophenol is discussed. AS

FOOD ENGINEERING AND EQUIPMENT

Engineering

- 1430 Chau (KV) and Gaffney (JJ). A finite-difference model for heat and mass transfer in products with internal heat generation and transpiration. *Journal of Food Science* 55(2); 1990; 484-487

A finite-difference numerical model for heat and mass transfer in products with respiration and transpiration is presented. Besides conduction and convection, the model also accounts for evaporative cooling due to transpiration and radiation heat transfer. The model is more accurate than currently used finite-difference models and requires larger time steps. AS

- 1431 Ramaswamy (HS) and Ghazala (S). Centerpoint nutrient degradation in heat processed conduction heating food model. *Journal of Food Process Engineering* 12(3); 1990; 159-169

A methodology was developed for the evaluation of centerpoint nutrient degradation in conduction heating canned food subjected to thermal processing. The methodology involved sealing of 75 MUL aliquote of test solution in leakproof pressure stable stainless steel capsule, placing the capsule at the geometric center of a can filled with a conduction heating simulated food prior to the closure, and recovering the capsule and analyzing the contents following a given thermal treatment. Exp. carried out using aqueous solutions of ascorbic acid and thiamine indicated good reproducibility of the results. Employing kinetic data for thermal destruction of the nutrients and center temp.-time history of the food simulant obtained from several simultaneously processed cans, the centerpoint nutrient retention predicted by several models agreed favourably with the experimental results. AS

- 1432 Stoforos (NG) and Merson (RL). Estimating heat transfer

coefficient in liquid/particulate canned foods using only liquid temperature data. *Journal of Food Science* 55(2); 1990; 478-483, 521

A mathematical procedure was developed to estimate heat transfer coeff. for heated rotating cans of food comprised of a liquid and spherical particles. The method uses experimental data for only the fluid temp., and heat transfer coeff. are obtained by comparing predicted with experimental fluid temp. data in the Laplace transform plane. Results obtained using the procedure were compared with experimentally obtained heat transfer coeff. from the literature for three cases: potato spheres in deionized water, Teflon spheres in deionized water, and aluminium spheres in silicone fluid. Agreement between predicted and experimental results depended upon the agreement of the experimental conditions and the assumptions associated with the model. AS

Equipments

Dryers

- 1433 Moreira (RG) and Bakker-Arkema (FW). A feed forward/feedback adaptive controller for commercial cross-flow grain driers. *Journal of Agricultural Engineering Research* 45(2); 1990; 107-116

The objectives were to develop a feed forward/feed backward adaptive control for continuous flow hot air grain dryers and to test the control system in two commercial cross flow grain dryers. The control of moisture content(MC) in the driers was obtained by changing the speed of the unloading sugars. The experimental data obtained during normal operation tests were used to determine the model parameters. Two linear models were employed in conjunction with two control algorithms, generalised min. variance controller (GMV) and the pole placement controller (PP) in automatic control of the driers. The system consisted of a microcomputer, a tachometer, a semicontinuous moisture meter, A/D and D/A converters, a SCR for unload anger meter control and system software. The results showed that the GMV controller was slower. required additional process model parameters and was more complex than the PP controller. The PP controller maintained an outlet MC to with in plus or minus 0.3% of the set point during two dryer seasons. RS

Extruder

- 1434 Mohamed (IO), Ofoli (RY) and Morgan (RG). Modeling the average shear rate in a co-rotating twin screw extruder. *Journal of Food Process Engineering* 12(3); 1990; 227-246

A procedure similar to the one commonly used with mixers has been utilized to develop a model for estimating the shear rate in co-rotating twin screw extruders. Newtonian and non-Newtonian fluids were used to estimate the average shear rate for three screw configurations of a Baker Perkins (MPF-50D) twin screw extruder. As would be expected, the shear rate was highly correlated to the screw speed. At a given screw speed, 30 forwarding paddles generate the highest rate of shear, followed by feed screws and single lead screws. No data was found in the published literature to provide comparison with the results of this work. However, the model as performed well in heat transfer analysis of twin screw processes. The procedure is sensitive to screw configuration, accounts for the shearing effects in the different regions within the extruder barrel, and covers a range of screw speeds (100-400 RPM) typical of what is encountered in industrial pilot plants. Even though much more work remains to be done before the shear rate can be confidently characterized for composite screw configurations, this technique provides a sound foundation. AS

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

- 1435 Berry (MF), Singh (RK) and Nelson (PE). Kinetics of methylmethionine sulphonium salt destruction in a model particulate system. *Journal of Food Science* 55(2); 1990; 502-505

The kinetics of methylmethionine sulphonium salt (MMS) degradation in a model food system during simulated aseptic thermal processing was investigated under controlled conditions for 1.27 cm side and 2.54 cm side sodium alginate cubes. To determine if concn. of MMS affected the kinetics as influenced by the cube geometry or comp., three concn. levels of MMS were investigated. The initial concn. of MMS in the particles, the particle size and particle shrinkage did not affect the reaction kinetics. The first order reaction rate constant for MMS destruction at 126.7 °C was 0.15 min^{-1} and the activation energy was 28.95 kcal/mole. AS

- 1436 Chen (CS). Predicting water activity in solutions of mixed solutes. *Journal of Food Science* 55(2); 1990; 494-497, 515

The Ross equation is a multiplicative procedure for estimating the water activity of aqueous unprocessed food preparations that contain only solutes, only food polymers, or mixtures of solutes and polymers. Using accurate water activity values of single solute solutions in the Ross equation resulted in prediction accuracies to plus or minus 0.01 water activity for 118 of 120 multiple-solute solutions. The exceptions at plus or minus 0.02 water activity occurred within a range of concentrated solutions containing NaCl, KCl and CaCl. AS

- 1437 Mora-Gutierrez (A) and Baianu (IC). Hydration studies of maltodextrins by proton, deuterium and oxygen-17 nuclear magnetic resonance. *Journal of Food Science* 55(2); 1990; 462-465, 474

Comparative studies of the hydration of maltodextrins were undertaken by proton, deuterium and oxygen-17 NMR. The ^1H and ^2H NMR transverse relaxation rates of hydrated maltodextrins were sensitive to both chemical exchange with the solvent and hydrogen bonding involving hydroxyl groups. The short average correlation time of water "bound" to maltodextrins (-47 ps) derived from our ^{17}O -NMR data shows that water is highly mobile and the maltodextrins-at high moisture contents-contribute little to the stability of food products. The onset of aggregation is monitored by all three nuclei. The mechanism of this aggregation process involves hydrogen bonding in unheated polysaccharide mixtures and waxy maize starch samples, and is markedly affected by heating to 60 C. AS

- 1438 Sattar (A), Wahid (M) and Durrani (SK). Concentration of selected heavy metals in spices, dry fruits and plant nuts. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(3); 1989; 279-286

Different sp., dry fruits and plant nuts commonly consumed in Pakistan were assayed for the heavy metals Cd, Pb, Cu, Zn, Fe and Mn by the potentiometric stripping analysis and AA spectrophotometry. The results revealed wide variation in heavy metal content among different biological materials. Mixed spices generally exhibited higher value for trace metals specially Pb (6.6-9.2 $\mu\text{g/g}$), Cd (0.65-1.34 $\mu\text{g/g}$), Fe (142.3-285.0 $\mu\text{g/g}$) and Zn (64.2-65.8 $\mu\text{g/g}$). Dry fruits contained relatively lesser amounts of heavy metals than plant nuts. Almonds contained higher levels of Pb (1.02 $\mu\text{g/g}$) and Cd (0.24 $\mu\text{g/g}$) than other nuts and dry fruits. AS

Chemistry (Analytical)

- 1439 Demertzis (PG), Riganakos (KA) and Kontominas (MG). Water sorption isotherms of crystalline raffinose by inverse gas chromatography. *International Journal of Food Science and Technology* 24(6); 1989; 629-636

The interaction of water with crystalline raffinose was studied by inverse gas chromatography. Water sorption isotherms were constructed at 30, 35, 40 and 50 °C with water activity, values between 0.0 and 0.7. Experimental data were successfully fitted to the BET, GAB and Freundlich equations and the monolayer and sorptive capacities of raffinose were calculated. These values were found to be lower than the corresponding literature values for other sugars and were attributed to the high degree of crystallinity of raffinose. The thermodynamics of the above interaction were further studied by application of the Zimm-Lundberg cluster theory. Results indicate a strong tendency for water mol. to cluster even at relatively low water activity. AS

- 1440 Mendes (MCS). Evaluation of confirmation of acetylation-gas-liquid chromatographic method for the determination of triadimenol in foods. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 174-178

An acetylation technique using acetic anhydride followed by GLC is evaluated for a triadimenol fungicide. Identity of the derivative was confirmed by nuclear magnetic resonance and infrared spectral data. Recoveries of the acetylated analogue of triadimenol from foods studied at fortification levels of 0.1-0.2 mg/kg were usually > 80%. AS

- 1441 Ruiz (CC), Bayona (AH) and Sanchez (FG). Derivative spectrophotometric determination of vanillin and p-hydroxybenzaldehyde in vanilla bean extracts. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 178-181

Vanillin (4-hydroxy-3-methoxybenzaldehyde) and p-hydroxybenzaldehyde were determined by spectrophotometric derivative measurements in vanilla bean extracts. The method tolerates p-hydroxybenzaldehyde to vanillin ratios of 3:1 (w/w) with relative error below 5% in the detn. of vanillin. This method compares favourably with the official AOAC spectrophotometric procedure. Relative errors of 0.70% and RSD's of 1.0% are obtained. AS

FOOD MICROBIOLOGY AND HYGIENE

Ethyl alcohol

- 1442 Koutinas (AA) and Kanellaki (M). Continuous potable alcohol production by immobilized *Zymomonas mobilis* on Gamma-alumina pellets. *Journal of Food Science* 55(2); 1990; 525-527, 531

Experiments were carried out with *Z. mobilis* immobilized on Gamma-alumina pellets in a continuous reactor for potable alcohol production. It was found that Gamma-alumina was a suitable support for continuous ethanol production processes. Specifically, an ethanol productivity (calculated on the basis of liquid vol.) of 23.8 g/ l/hr was achieved at 0.88 hr⁻¹ dilution rate, 159 g/l invert sugar content and 43.7% conversion, using raisin extracts as feed material. Similar productivities were obtained with media containing glucose. Biomass productivity, yield and free cells concn. in glucose and raisin extracts were examined. Ethanol production was constant during the time the system was operated, a period of over 60 days. AS

Microorganisms

- 1443 Knutson (KM) and Zottola (EA). Evaluation of an inoculation system for a closed bulk starter vessel. *Journal of Food Protection* 52(10); 1989; 715-718

Stainless steel vessels (open, closed and control i.e. not exposed to aerosol) containing 10% reconstituted non-fat dry⁶ milk were inoculated with *Streptococcus cremoris* at 10 CFU/ml. Milk in the closed vessel was specifically inoculated through a rubber seal in a port using a sterile needle and syringe in the presence of an aerosol containing bacteriophage *Escherichia coli* and milk or whey solids. The lid of the open vessel was removed for 2 min to expose milk to the aerosol. Milk was incubated at 22 C for 16 h. Samples were tested for pH, titratable acidity, and *E. coli* and host and bacteriophage numbers. *E. coli* and bacteriophage were recovered from the open vessel, and not the control and closed vessels. This inoculation system minimized exposure of bulk starter medium to an aerosol and reduced the risk of producing bulk starter contaminated with bacteriophage. AS

- 1444 Papadopoulou (C) and Xylouri (E). An assessment of Rappaport-Vassiliadis medium based on growth kinetics. *Journal of Food Protection* 52(4); 1989; 252-253

The growth of eleven *Salmonella* serotypes cultured in modified Rappaport-Vassiliadis medium was compared with the

growth in selenite broth and in nutrient broth. The growth of other enterobacteria in the three media was also studied. The mean generation times of all the serotypes were calculated by fitting the experimental data to the exponential growth law. The results showed that Rappaport-Vassiliadis medium sustained the growth of nine *Salmonella* serotypes and proved more successful in limiting the growth of other enterobacteria than did the selenite or nutrient broths. AS

- 1445 Peters (H-U), Herbst (H), Hesselink (PGM), Lunsdorf (H), Schumpe (A) and Deckwer (W-D). The influence of agitation rate on xanthan production by *Xanthomonas campestris*. *Biotechnology and Bioengineering* 34(11); 1989; 1393-1397

This study deals with production of xanthan in *Xanthomonas campestris* in buffed stirred tank reactor. Oxygen limitation has encountered at low stirring speeds in xanthan batch fermentations. This resulted in significantly lower specific xanthan production rates and some-what lower mol. wt. of the products than at high agitation rates. Lower stirring speeds did not affect the production and product quality when oxygen limitation at low stirring speed was avoided by spraying oxygen enriched air. When scaling fermentors for xanthan production, sufficient oxygen supply to the whole culture will be the main requirement. GAR

- 1446 Sharpe (AN), Diotte (MP), Dudas (I), Parrington (LJ) and Peterkin (PI). Technique for maintaining and screening many microbial cultures. *Food Microbiology* 6(4); 1989; 261-265

A computer assisted technique which permitted deployment of 400 microbial cultures per hydrophobic grid membrane filter, replication for biochemical screening and automatic data capture, saved time and labor compared with conventional subculture and screening methods. AS

Bacteria

- 1447 Shah (N) and Jelen (P). Survival of lactic acid bacteria and their lactases under acidic conditions. *Journal of Food Science* 55(2); 1990; 506-509

Effects of sonication, survival, and beta-galactosidase activity of four lactic cultures were investigated in pH 1.5-3.5 range. *Lactobacillus delbruekii* subsp. *bulgaricus* and *Streptococcus thermophilus* exhibited the highest beta-galactosidase activity in skim milk and broth systems, resp. The beta-galactosidases from *L. delbruekii* subsp. *bulgaricus*, *S. thermophilus*, and *L. acidophilus* showed optimum activity in the neutral pH range and 55 C. Viable count of all four cultures decreased most rapidly at pH 1.5, but *L. acidophilus*

and *L. delbruekii* subsp. *bulgaricus* survived better than the other organisms. The decrease of enzyme activity of unsonicated cultures with pH was slight, especially at pH 3.5. However, acidification of sonicated cultures to pH 3.5 or lower resulted in rapid and permanent loss of enzyme activity. AS

Bacillus stearothermophilus

- 1448 David (JRD) and Merson (RL). Kinetic parameters for inactivation of *Bacillus stearothermophilus* at high temperatures. *Journal of Food Science* 55(2); 1990; 488-493, 515

High temp. thermal death parameters for *Bacillus stearothermophilus* TH24 (NCDO 1096) spores in water were determined using a computer-controlled reactor. The equipment produced and recorded accurate, reproducible square-wave temp. transients during very short heating times (- 0.1 sec). Survivor curves and the phantom thermal death time (TDT) curve between 130 and 155 C from reactor data were compared to results from oilbath-heated capillary tubes between 115 and 135 C. The TDT curve was nonlinear in the high temp. range but could be described by two lines with $z = 9.3$ C for temp. between 115 and 145 C and $z = 16.9$ C for temp. above 145 C. An Arrhenius plot did not represent the data better. AS

Escherichia coli

- 1449 Sharpe (AN), parrington (LP), Diotte (MP) and Peterkin (PI). Evaluation of indoxyl beta-D-glucuronide and hydrophobic grid membrane filters for electronic enumeration of *Escherichia coli*. *Food Microbiology* 6(4); 1989; 267-280

Listeria

- 1450 Peterkin (PI), Idziak (ES) and Sharpe (AN). Screening DNA probes using the hydrophobic grid membrane filter. *Food Microbiology* 6(4); 1989; 281-284

Seven clones showing beta-hemolysis, from a *Listeria monocytogenes* genomic library, were assessed by a hydrophobic grid-membrane filter (HGMF) screening technique for their specificity and DNA probes. Plasmid DNA from each of the clones was screened by colony hybridization against replicates of a library of 100 organisms, consisting of 70 *L. monocytogenes* strains, ten other *Listeria* spp., and 20 organisms of other genera, arrayed on an HGMF. Clones showing potential for use in analytical food microbiology were identified by this means. AS

Listeria monocytogenes

- 1451 Ahamad (N) and Marth (EH). Behaviour of *Listeria monocytogenes* at 7, 13, 21, and 35 C in tryptose broth acidified with acetic, citric, or lactic acid. *Journal of Food Protection* 52(10); 1989; 688-695

Inhibition of *Listeria monocytogenes* CA and V7 by of acetic, citric, and lactic acid at 7, 13, 21, and 35 C was investigated. Statistical analysis showed interactive effects between temp., types, and concn. of acids and strains of the pathogen. Presence of upto 0.1% of acetic, citric and lactic acids in the medium (tryptose broth) inhibited growth; the degree of inhibition increased as the temp. of incubation decreased (no growth occurred in the presence of 0.1% acetic acid at 7 C). *L. monocytogenes* was inactivated at all temp. when acid concn. in the medium were 0.3% or greater. Acetic acid was most detrimental to *L. monocytogenes* followed in order by lactic and citric acids. The antilisterial activity of these acids coincided with their degree of undissociation. Citric and lactic acids, with larger dissociation constants, were less detrimental to the pathogen than was acetic acid. AS

- 1452 Glass (KA) and Doyle (MP). Fate and thermal inactivation of *Listeria monocytogenes* in beaker sausage and pepperoni. *Journal of Food Protection* 52(4); 1989; 226-231

Listeria monocytogenes may survive the typical process used to produce sausage such as pepperoni and hard salami that is made from uncooked meat. Studies were done to identify heat treatments that could be applied during sausage-making to inactivate the organism to undetectable levels. Initial studies with beaker sausages revealed that heat treatments of 51.7 C for 8 h or 57.2 C for 4 h reduced *L. monocytogenes* counts by $> 2 \log_{10}$ CFU/g, but for each treatment the organism was detected by enrichment in one of two samples. Heating beaker sausage to an internal temp. of 62.8 C inactivated listeriae to undetectable levels. Studies with pepperoni revealed that heating sausage at 51.7 C for 4 h after fermentation but before the drying cycle killed most *L. monocytogenes*, but the organism was occasionally detected in samples during drying. Heating pepperoni at 51.7 C for 4 h after the drying cycle completely inactivated *L. monocytogenes* in all samples. An additional study done to determine the fate of *L. monocytogenes* in beaker sausage made with and without lactic starter culture revealed that the organism could grow at 32.2 C in sausage batter during the fermentation period if the lactic starter culture was not added. The organism did not grow, but was reduced by about 1 to 2 $\log_{10}$ CFU/g during fermentation, in sausage made with

lactic starter culture. AS

- 1453 Golnazarian (CA), Donnelly (CW), Pintauro (SJ) and Howard (DB). Comparison of infectious dose of *Listeria monocytogenes* F5817 as determined for normal versus compromised C57B1/6J mice. *Journal of Food Protection* 52(10); 1989; 696-701
- 1454 Prentice (GA). Living with listeria. *Journal of the Society of Dairy Technology* 42(2); 1989; 55-58

Since its first discovery as a pathogen of both humans and animals, the significance of *L. monocytogenes* has gradually unfolded, although it is far from clear. The incidence of listeriosis in the UK is increasing and as yet the reason for this is unknown. Also of significance is that with the increase in the number of foods being examined, it is becoming clear that the incidence of *L. monocytogenes* is much greater than was originally thought. More recent data on the incidence of listerias in food have been determined using modified McBride's Agar. Recently developed agars give a much greater recovery. Does this mean that present ideas about current levels and acceptable limits need to be revised upwards?. There are many questions remaining about this enigmatic micro-organism. However, because of its commercial significance much effort is now being devoted to its study. It is hoped that this will lead to a much greater understanding of the pathogenesis, epidemiology and ecology of the micro-organism and make 'Living with Listeria' more comfortable and less expensive than it has recently been. AS

Pseudomonas fluorescens

- 1455 Fernandez (I), San Jose (C) and McKellar (RC). Repression of *Pseudomonas fluorescens* extracellular lipase secretion by arginine. *Journal of Dairy Research* 57(1); 1990; 69-78

Studies to develop a minimal medium for optimal extracellular enzyme synthesis revealed that inclusion of arginine in the media resulted in low lipase activity. Studies with *Pseudomonas fluorescens* 32A showed that arginine repressed lipase production when N was supplied partially or totally as arginine. Proteinase production was unaffected under the same conditions. When cells were pre-grown in an arginine-containing medium, arginine did not repress lipase secretion, however, repression was observed with induced cells. Of the several arginine-analogues tested for the ability to repress lipase secretion, L-homoarginine and L-canavanine were the most effective. D-Arginine, L-arginine methyl ester and L-ornithine did not cause repression. With the exception of glutamic acid and methionine, those amino acids that supplied N but not C for growth were found to

repress lipase secretion. Accumulation of metabolic intermediate(s) may cause repression of lipase production. Study gives additional evidence to the existence of different mechanisms of regulation for production of lipase and proteinase. MCV

Salmonella typhimurium

- 1456 Strantz (AA) and Zottola (EA). A modified plating technique for the recovery and enumeration of stressed *Salmonella typhimurium*. *Journal of Food Protection* 52(10); 1989; 712-714

A plating technique that would allow for recovery and enumeration of stressed *Salmonella typhimurium* was developed. The strain of *S. typhimurium* used in this study was isolated from an outbreak of salmonellosis caused by the consumption of contaminated pasteurized milk. Cultures propagated for 18 h at 37 C in Tryptic Soy Broth (TSB) were enumerated on Brilliant Green Agar (BGA), *Salmonella*-*Shigella* agar (SS), Xylose Lysine Desoxycholate Agar (XLD) and Hektoen Enteric Agar (HE). Recovery of 10^1 to 10^3 fewer cells was seen on the selective agars as compared to recovery on Tryptic Soy Agar (TSA). When the culture was spread plated onto TSA, allowed to stand at room temp. for 4 h, overlaid with XLD, HE, or SS, and incubated at 37 C for 24 h, recovery levels were comparable to recovery on TSA. Enhanced recovery of *S. typhimurium* cells that had been injured by freezing in TSB or in blended whole egg, or by heating at 54 C was also seen. In some cases recovery was at a higher level when the overlay procedure was used than on control TSA plates. Recovery of *S. typhimurium* from cheese that had been artificially contaminated with *S. typhimurium*, *Staphylococcus aureus*, and *Pseudomonas fragi* exceed control MPN values when the overlay procedure was used, although the recovery rate was within the MPN 95% confidence limits. The selective and differential properties of XLD, HE, and SS were maintained. *Salmonella* colonies appeared black, while the starter culture bacteria, *S. aureus* and *P. fragi* appeared as pinpoint white colonies. The potential exists for this procedure to be used for the direct enumeration of sublethally stressed salmonellae if their numbers exceed 100 per gram. AS

Staphylococcus aureus

- 1457 Halpin-Dohnalek (MI) and Marth (EH). Characterization of strains of *Staphylococcus aureus* by their lipolytic activity on various agar media. *Journal of Food Science* 55(2); 1990; 591-592

Staphylococcus aureus strains 100-A, 196-E, 254, 473, 505 and 521 were plated on Spirit Blue Agar, Spirit Blue Milk Fat

Agar, Nutrient Milk Fat Agar, and Double-Layer Agar plates containing milk fat to determine lipolytic activity. All strains produced dark blue colonies surrounded by blue zones and clearing on Spirit Blue Milk Fat Agar. Results varied for Spirit Blue Agar, Nutrient Milk Fat Agar, and double-layer agar plates, although all strains were at least weakly lipolytic on all agars. *S. aureus* strains 100-A, 196-E, 505 and 521 demonstrated greater lipolytic activity on milk fat than did strains 254 and 473. Degree of lipolytic activity on agars containing milk fat is a means for characterizing different strains of *S. aureus*. AS

Streptococcus

- 1458 Thompson (JK) and Collins (MA). Some observations on the use of "API-STREP" bacterial identification system to classify strains of lactococci (lactic streptococci) from commercial starter cultures. *Food Microbiology* 6(4); 1989; 211-222

Streptococcus cremoris

- 1459 Booth (M), Donnelly (WJ), Fhaolain (I), Jennings (PV) and O'Cuinn (G). Proline-specific peptidases of *Streptococcus cremoris* AM2. *Journal of Dairy Research* 57(1); 1990; 79-88

Proline and proline-containing peptides are known to play a role in the development of flavour in cheese. Because of its unique structure, proline requires the presence of specialised peptidases and proteinases to effect its release from proteins in which it is a constituent. The present study identifies proline-specific peptidases found in *Streptococcus cremoris* AM2. These activities were present predominantly in the cytoplasmic fraction of the cells with minor amounts in cell membrane fraction. No evidence was found for such activities in either the extracellular fluid used to grow the cells, in the wash fraction or in the cell wall fraction. The proline-specific peptidases present in various subcellular fractions of *Str. cremoris* AM2 were prolidase, prolinase, post-proline dipeptidyl aminopeptidase, dipeptidyl peptidase I, post-proline endopeptidase, proline iminopeptidase and carboxypeptidase P. These peptide hydrolases confer on the organism the ability to release free proline from intermediary products of protein breakdown and which may degrade potentially bitter peptides containing proline residues. MCV

- 1460 Booth (M), Ni Fhaogain (I), Jennings (V) and O'Cuinn (G). Purification and characterisation of a post-proline dipeptidyl amino peptidase from *Streptococcus cremoris* AM2. *Journal of Dairy Research* 57(1); 1990; 89-99

The present study describes the purification of a post-

proline dipeptidyl aminopeptidase from the cytoplasm of *Streptococcus cremoris* AM2. On the basis of its elution from a calibrated Sephadex G200 column, the enzyme had a mol. wt. of 117000 and exhibited a broad pH optimum activity between 6.0 and 9.0. The activity was most comprehensively inhibited by phenylmethylsulphonylfluoride and more modestly inhibited by 1, 10 phenanthroline and 8-hydroxyquinoline but not by EDTA. A range of peptides containing either proline or alanine as the penultimate amino acid residue could act as substrates. The presence of proline on the carboxyside of the scissile bond prevented hydrolysis. However the enzyme could release Pro-Pro from Pro-Pro-Gly-Phe-Ser-Pro. The significance of this substrate specificity is considered in the context of removal of either single proline residues or prolylproline sequence from oligopeptides during cheese ripening. AS

Yersinia enterocolitica

- 1461 Tsay (WI) and Chou (CC). Influence of potassium sorbate on the growth of *Yersinia enterocolitica*. *Journal of Food Protection* 52(10); 1989; 723-726

The growth and survival of *Yersinia enterocolitica* 0:3 and 0:8 were determined using Brain Heart Infusion Broth at pH 5.5 or 6.5 with 0, 250, 500, 1000, 1500, 2500, or 5000 p.p.m. potassium sorbate, and incubated at 25 or 3 C. Results showed that *Y. enterocolitica* was susceptible to the antimicrobial activity of potassium sorbate. At 25 C and pH 5.5, a population increase of 6.8 and 6.9 log CFU/ml was noted for *Y. enterocolitica* serotypes 0:3 and 0:8 resp., in broth without potassium sorbate. The presence of 1000-1500 p.p.m. potassium sorbate in broth retarded the growth of the inoculated *Y. enterocolitica* cells or partially or completely inactivated them. At 25 C and pH 6.5, potassium sorbate at a concn. as high as 5000 p.p.m. did not inactivate this pathogen. All the concn. of potassium sorbate tested only retarded the growth of *Y. enterocolitica*. At 3 C and pH 5.5, *Y. enterocolitica* grew slightly in the control broth. The presence of 250-500 p.p.m. or more potassium sorbate in growth completely inhibited the growth of *Y. enterocolitica* or reduced the number of viable cells. At 3 C and pH 6.5, a slight increase in the population of *Y. enterocolitica* was observed in the growth with or without potassium sorbate, but the increase slacked off as the amount of potassium sorbate was increased. AS

Fungi

- 1462 Kamphuis (HJ), Notermans (S), Veeneman (GH), Van Boom (JH) and Rombouts (FM). A rapid and reliable method for the detection

of molds in foods. Using the latex agglutination assay. *Journal of Food Protection* 52(4); 1989; 244-247

An agglutination test by using latex beads (0.8 μ m diameter) coated with IgG from the antibodies against extracellular polysaccharide of *Penicillium digitatum* has been developed. As low as 5 to 10 ng/ml of the purified extracellular polysaccharide of the same sp. can be detected by this preparation. Analysis of culture filtrates from 25 different molds showed that the positive reactivity was obtained only with the sp. of general *Penicillium* and *Aspergillus*. The application of this test was confirmed in testing the samples of sp. and nuts. Further, the reliability could be enhanced by including specific blocker in the assay, the synthetic epitopes consisting of four Beta (1-5)-linked D-galactofuranosyl residues. AS

Mushrooms

- 1463 Lowum (SE) and Parkin (KL). Characterization of dye-sensitized photooxidation of mushroom tyrosinase. *Journal of Food Biochemistry* 13(5); 1989; 391-401

Dye-sensitized photooxidation was investigated as a non-thermal means to inactivate food quality-related enzymes, using mushroom tyrosinase as a model illumination of tyrosinase in the presence of either rose bengal or riboflavin resulted in an apparent first-order destruction of enzyme activity. Both dye and light were required, and photoinactivation was favoured by increasing levels of dissolved oxygen. The rose Bengal-sensitized photooxidation was generally more rapid than that caused by riboflavin (at 0.01% dye,), with K values ranging from 0.74 to 1.66 h⁻¹ and 0.25 to 1.23 h⁻¹, resp. First-order rate constants for photoinactivation decreased with decreasing temp. (E_a was 8.4 to 12.2 Kcal Mol⁻¹ between 20 and 50 °C), increasing protein concn. (0.175 to 1.40 mg⁻¹ ml), increasing sodium phosphate buffer concn. (10 to 200 mM) and increasing ionic strength (0.02 to 0.20). The dependence of enzyme photoinactivation rates on pH (between 6.0 and 9.0) resembled a titration curve with a pH of 7.5, and maximal rates were observed at pH 8.0-9.0. AS

- 1464 Notermans (S), Dufrenne (J) and Gerrits (JPG). Natural occurrence of *Clostridium botulinum* on fresh mushrooms (*Agaricus bisporus*). *Journal of Food Protection* 52(10); 1989; 733-736

Clostridium botulinum was not found (< 1/100g) in fresh commercial mushrooms produced in the Netherlands. The log₁₀ mean number of anaerobic spores in mushrooms was 3.19/g. In

casing soil of mushroom production beds, however, *C. botulinum* was detected, and numbers varied from < 1.3 to $1.6/100$ g. Log_{10} counts of anaerobic spores present in this material amounted to $5.58/\text{g}$. If it is assumed that the ratio of the number of anaerobic spores to the number of *C. botulinum* in mushrooms is the same as that in casing soil, then the estimated incidence of *C. botulinum* in mushrooms was between < 0.08 to 0.16 organisms per 100 g of produce. AS

Yeasts

- 1465 Mustafa (MK) and Halasz (A). The effect of date syrup concentration on growth rate, protein, RNA content and protease activity of *S. cerevisiae*, *C. guilliermondii* and *R. glutinis*. *Acta Alimentaria* 18(2); 1989; 177-192

With increasing date syrup content of the fermentation medium, growth rate of *S. cerevisiae*, *C. guilliermondii* and *R. glutinis* increased. Protein content of *S. cerevisiae* increased in the range of 0.1 to 0.3% date syrup concn. The whole synthesized protein increases at higher date concn. for each strain. RNA content of the investigated yeast strains varied with date syrup concn. and strain as well. For *S. cerevisiae* increase in carbon source concn. caused a gradual increase in RNA. *C. guilliermondii* seemed to be the independent of date syrup concn. in this respect. The proteinase activity at the end of fermentation was highest in *S. cerevisiae* with max-value at 0.5% date syrup concn. *C. guilliermondii* showed similar variation in protease activity as *S. cerevisiae*, but the absolute values were significantly lower in each case. Our exp. showed that date syrup is a good substrate for yeast strains of different genera. For biomass production *C. guilliermondii* and *R. glutinis* gave much better results in cell concn. than *S. cerevisiae*. AS

Hygiene

Bacteria

Listeria monocytogenes

- 1466 Gaze (JE), Brown (GD), Gaskell (DE) and Banks (JG). Heat resistance of *Listeria monocytogenes* in homogenates of chicken, beef steak and carrot. *Food Microbiology* 6(4); 1989; 251-259

The heat resistance of two strains of *Listeria monocytogenes* Scott A (F4642) and NCTC 11994) was determined in homogenates of chicken, beef steak and carrot over the temp. range $60-70$ C. The D values at 70 C ranged from 0.14 to 0.27 min and the z values ranged from 5.98 to 7.39 C.

These data illustrate that in order to achieve a six log reduction of this microorganism, the slowest heating point in a food product should be held at 70 C for 2 min. AS

BIOTEHNOLOGY

Nil

TISSUE CULTURE

Nil

FOOD ADDITIVES

Flavourings

- 1467 Sadler (GD) and Braddock (RJ). Oxygen permeability of low density polyethylene as a function of limonene absorption. An approach to modeling flavour "Scalping". *Journal of Food Science* 55(2); 1990; 587-588

A procedure was developed to measure adsorption (scalping) of limonene by low density polyethylene. The polymer was mounted on an oxygen electrode. Limonene adsorption produced an increase in oxygen permeability which appeared proportional to limonene concn. Diffusion coeff. calculated from permeation curves were similar to diffusion coeff. calculated on a wt. change basis. AS

Sweeteners

Thaumatococcus

- 1468 Ramsdell (PV) and Kozlov (IA). An investigation of enzyme activities found in thaumatococcus preparations. *International Journal of Food Science and Technology* 24(6); 1989; 619-627

A new alkaline cathodic gel has been developed which improves on the acidic cathodic gel of Reisfeld, Lewis and Williams (1962) when resolving thaumatococcus isoproteins in commercial thaumatococcus by electrophoresis. This new gel was used in the investigation of protease and esterase activities in commercial thaumatococcus and thaumatococcus isoprotein preparations.

Enzyme activity stainings of the thaumatins on the new gel indicate that these activities do not belong to thaumatin but to contaminating enzymes. Other data, such as the decrease in the protease and esterase activities as a result of further purification of the thaumatins and the titration of the proteolytic activities with the specific inhibitor, E-64, also support this conclusion. AS

CEREALS

- 1469 Agrawal (AK), Kanjilal (SC) and Bansode (PC). A study on grain cleaning methods prevailing in grain mandies of Madhya Pradesh. *Bulletin of Grain Technology* 27(2); 1989; 91-98

Methods of cleaning wheat and Bengal gram in Jabalpur, Katni, and Gadarwara grain mandis of Jabalpur (Madhya Pradesh, India) were studied. Manually operated gravity flow cleaner and manual cleaning are the common methods followed in all the grain mandis. The cleaning efficiency of the former was 40.0% and 38.6% and the cost of cleaning is Rs.0.53 and Rs. 0.43 per quintal of wheat and gram resp. The cleaning efficiency and cost of cleaning of wheat by manual operation was 91.4% and Rs. 8.0/quintal resp. The performance of both the methods are too low level when compared to the pedal operated air screen cleaner. SRA

- 1470 Bunzi (K) and Kracke (W). Transfer of Cs and Sr to flour, bran and straw from wheat, rye, barley and oats during the years 1982, 1986 (reactor accident at Chernobyl) and 1987 field measurements. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 188(5); 1989; 439-444 (De).

The specific activity of ^{137}Cs and ^{90}Sr from the global fallout, as well as from the fallout after the reactor accident at Chernobyl, was determined in flour, bran and straw from wheat, rye, and barley and oats as well in the corresponding soils (Cambisol). The results show that the activity of ^{137}Cs but not of ^{90}Sr , in the plant material was considerably higher in 1986, and still to some extent in 1987, compared to 1982. For ^{137}Cs and ^{90}Sr , as well as for most cereal samples, the activity in the bran and straw was significantly higher than in the flour. Detn. of stable K and C in all samples revealed that this enrichment is, to a large extent, the results of a comparable enrichment of these elements in brans and straw. The plant/soil concn. ratios, averaged over all cereals, were for ^{137}Cs (1982 and 1987); flour 0.026 plus or minus 0.018; bran 0.079 plus or minus 0.042; straw 0.055 plus or minus 0.027. For ^{90}Sr (1982, 1986 and 1987): flour 0.19 plus or minus 0.095; bran 0.70 plus or minus 0.23; straw 2.35 plus or

minus 0.82. AS

- 1471 Christian (P) and Subadra Seshadri. Counteracting the inhibitory effect of tea on the *in vitro* availability of iron from cereal meals. *Journal of the Science of Food and Agriculture* 49(4); 1989; 431-436

The present study assessed the *in vitro* availability of Fe from a typical cereal meal with or without tea, ascorbic acid and milk in all possible combination. The availability of Fe from the cereal meal was low (3.9%). Addition of tea to the meal, had a significant depressing effect on available Fe (2.56%). Ascorbic acid (100 mg) or milk (200 g) when added completely counteracted the inhibitory effect of tea, and addition of both ascorbic acid and milk brought about an even greater enhancement in the *in vitro* availability of Fe than when either was added alone. This results reveals that milk is as effective a factor as ascorbic acid in counteracting the depressing effect of tea on *in vitro* Fe availability. SRA

- 1472 Francois (PL). *In vitro* availability of starch in cereal products. *Journal of the Science of Food and Agriculture* 49(4); 1989; 499-501

The *in vitro* availability of starch in Hendebert breads and Lu biscuits are assessed. Starch digestibility increased in the order semi-sweet biscuits > museli > whole meal breads > white breads > french toast > extruded crisp bread. The results indicate that manufacturing conditions play a determinant role in starch availability *in vitro*. SRA

- 1473 Gupta (NK). Improvement in productivity through modernization and use of modern technology. *Indian Miller* 20(4); 1990; 38, 42, 44-45, 48

Modernization of roller flour mill to get max. quantity of a quality product at a max. extraction rate involves the following aspects which are reviewed briefly. Tailor made mill buildings, proper machine and equipment selection, conveying system, wheat conditioning, conservation of electric power and best use of man-power. A totality of these will improve the productivity of a flour mill. KAR

- 1474 Mosse (J). Nitrogen to protein conversion factor for ten cereals and six legumes or oilseeds. A reappraisal of its definition and determination. Variation according to species and to seed protein content. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 18-24

- 1475 Neet Pande, Jyothi Saxena and Mehrotra (BS). Determination of fungal and insect infestation of stored cereal grains and their

relationships. **Bulletin of Grain Technology** 27(2); 1989; 133-141

Of the 80 sp. of fungi isolated; 51 were from wheat, 43 from rice, 33 from maize and 37 from the surface as well as within the alimentary canal of insects. *Aspergilli* were the most common fungi followed by *Penicillia*, *Mucorales* and Imperfect fungi. *Aspergillus kambarensis* was reported first time from India. *A. flavus* was the most frequent fungi associated with these sp. of insects. *Tribolium castaneum*, *Sitophilus oryzae* and *Rhizopertha dominica* are the insects identified. *R. dominica* carried the least % of spore load externally (8.9-12.8) and internally (2-2.8), whereas *S. oryzae* carried the heaviest spore load. SRA

- 1476 Sirou (Y), Lecommandeur (D) and Lauriere (C). Specific enzymatic microassays of alpha-amylase and beta-amylase in cereals. **Journal of Agricultural and Food Chemistry** 38(1); 1990; 171-174

Two colorimetric assays for specific detn. in cereals of alpha- and beta-amylase, resp., were adapted for use in microtiter plates. The two micromethods allow easy and reliable detn. of alpha- and beta-amylase in a large number of samples. Application is provided with K_m detn. of barley, maize, sorghum, and rice alpha-amylases, resp. AS

Barley

- 1477 Chung (TY), Nwokolo (EN) and Sim (JS). Compositional and digestibility changes in sprouted barley and canola seeds. **Qualitas Plantarum - Plants Foods for Human Nutrition** 39(3); 1989; 267-278

Barley and canola seeds were sprouted over a 5 day period, in lab. conditions under room temp. (22 C) and room lighting. Following initial hydration, seeds were kept moist by wetting the germination trays at 9 a.m. 1 p.m. and 6 p.m. daily. A parallel germination exp. using 200 g quantities of seeds in petri dishes was conducted. Starting from the second day of germination, and every day, dishes of germinating seeds were removed, oven-dried, weighed and milled for proximate and chem. analysis. Seeds from the main germination exp. were fed in a digestibility trial to Wistar rats. Results indicated that sprouting was associated with depletion of many nutrients in both barley and canola, the major losses being in respect of dry matter, gross energy and triglycerides. In barley (but not in canola) sprouting was associated with significant increase in crude fibre and diglyceride content. In canola, there were significant losses in lipid content and increase in phytosterol and phospholipid content. Digestibility data showed an

enhancement in digestibility of nutrients in barley but not in canola, implying that sprouting improved nutritional quality of barley but not canola. AS

Oats

- 1478 Wilhelm (E), Kempf (W), Lehmussaari (A) and Caransa (A). Process technology for the production of starch, protein and fiber from oats. *Starch/Starke* 41(10); 1989; 372-376 (De).

Novel raw materials for starch manufacturing processes have gained greater importance since by-products of high value became more and more decisive for the economy of the entire production process. Oat as raw materials does not only contain small granule starch with novel technically suitable properties but also proteins, lipids, fibers, beta glucans and other valuable by-products for modern human nutrition and various industrial utilization purposes. Small granule starches with a narrow range of particle size distribution are of particular interest for the production in printing paper, biodegradable synthetic material and plastic sheets as well as technical and cosmetic powders. A process for the fractionation of oats developed from lab. scale results and a series of pilot plant tests runs up to 30 t of oats will be presented. AS

Rice

- 1479 Hibi (Y), Kitamura (S) and Kuge (T). Effect of lipids on the retrogradation of cooked rice. *Cereal Chemistry* 67(1); 1990; 7-10

The effect of lipids on the aging process of cooked rice stored at 5 °C was studied by measuring enzyme digestibility and X-ray diffraction patterns. For normal rice, simultaneous digestibility with beta-amylase and pullulanase, which is a good measure of degree of gelatinization, increased after 3 h of storage and then continuously decreased. X-ray diffraction patterns of normal rice immediately after cooking showed a V-type patterns that may be attributed to helical complexes of amylose with lipids in starch. V-type pattern intensity became faint in 5 h, whereas B-type pattern intensity increased, implying that the starch-lipid complexes were metastable and changed to a more stable structure partly characterized by B-type X-ray pattern via an amorphous state. This can illustrate the way in which lipids affect the retrogradation process of cooked rice. Water soluble carbohydrates from aged pastes of normal rice starch were also measured and found to increase and then decrease after 5 h of storage. This may also closely correlated with the behaviour of the starch-lipid complex. Gel permeation chromatography of the water-soluble carbohydrates indicated that an increase in solubility by defatting was due,

not only to the amylose fraction but also to the amylopectin fraction. AS

- 1480 Nigam (PM), Ram (DN), Verma (RA) and Uttam (JR). Relative resistance/susceptibility of rice varieties to *Oryzaephilus surinamensis* Linn. *Bulletin of Grain Technology* 27(2); 1989; 99-102

The resistance/susceptibility of 15 var. of rice ('Saket 4', 'Usar 1', 'N 22', 'Ratna', 'Prasad', 'T3', 'Chakia 59', 'Madhukar', 'Mashuri', 'Jaya', 'T. 23', 'IR 24', 'T 26', 'Getu' and 'Akashi') against *Oryzaephilus surinamensis* L. was done at Rice Research Station, Kalyanpur, Kanpur, India. The data based on adult population indicate that 'Chakia 59', 'Akashi' and 'Usar 1' are highly resistant than other var. against *O. surinamensis*. 'Mashuri' and 'T3' are least resistant to the pest; others are medium susceptible var. SRA

- 1481 Rajukannu (K), Azzez Basha (A), Doraisamy (P) and Balasubramanian (M). Insecticide residues in rice-effect of different formulations. *Madras Agricultural Journal* 76(1); 1989; 53-54

Standing rice crop was sprayed 4 times commencing from 15 days after transplanting with HCH (50% wettable powder (WP)) and 10% DDT dust (50% WP and 25% emulsion concn. and 10% dust), and carbaryl (50% WP and 10% dust). Residue of pesticide in grain and bran was analysed after harvest. The WP of DDT had left higher amount of HCH residues in grain but the amount was below the tolerance limit. The dust formulations of DDT and HCH did not leave any residue. Neither WP nor dust of carbaryl had left any residue in grain but the bran contained residues. KAR

- 1482 Sangwan (NK), Verma (BS), Ahlawat (TR) and Dhindsa (KS). Varietal differences in quality characters of rice. *Bulletin of Grain Technology* 27(3); 1989; 208-216

Among the 47 cvs. of rice representing early maturing (17), medium maturing (15) and scented (15), variability in white-rice yield, elongation and swelling ratio, increase in vol. and water-up-take during cooking was low, whereas wide variability was observed for grain breakage during milling and amylose and protein contents. Correlation coeff. among these parameters indicated that cv. with high white-rice yield possessed good cooking quality. SRA

- 1483 Sasmita Prusty, Bohidar (K) and Prakash (A). Evaluation of certain botanical products as grain protectants against rice moth, *Carcyra cephalonica* Staint (Galleridae: Lepidoptera) in stored rice. *Bulletin of Grain Technology* 27(2); 1989; 85-90

Some indigenous plant products have been tested as grain protectant against rice moth under lab. conditions. Dried leaves of begonia (*Vitex negundo*), wild sage (*Lippia geminata*); bel (*Aegle marmelos*); neem (*Azardirachta indica*); Pudina (*Mentha spicata*) and extract of garlic have been evaluated under controlled conditions as grain protectant against rice moth (*Corcyra cephalonica*) in milled rice stored in plastic containers. Wildsage leaves inhibited the larval and adult moth population when the eggs were released in rice grain admixed with these products. Garlic extract although inhibited larval population, other plant materials failed to inhibit larval as well as adult populations of this moth in milled rice. SRA

Brown rice

- 1484 Villareal (CP) and Juliano (BO). Variability in contents of thiamine and riboflavin in brown rice, crude oil in brown rice and bran-polish, and silicon in hull of IR rices. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(3); 1989; 287-297

Among 30 'IR' varieties, had greater effect on thiamine content of brown rice than season. Both season and var. affected riboflavin content. Purple- and red-pericarped Philippines rices had higher riboflavin and crude protein contents than IR rices. Crude oil contents of brown rice and bran-polish of 19 IR rices were significantly affected by var., but only brown rice oil content was significantly affected by season. Bran-polish of waxy rice IR 29 had the highest oil content. Silicon content of hull of 16 IR rices showed significant variation due to var. and season and tended to be higher in the dry season crop. Var. ranking in nutrient comp. were not consistent for the two crops. The levels of nutrients of IR rices were within the range of values reported for other rices. AS

Ryes

- 1485 Plaami (S), Saastaminen (M) and Kumpulainen (J). Effect of variety and environment on dietary fibre content of winter rye in Finland. *Journal of Cereal Science* 10(3); 1989; 209-215

Water insoluble dietary fiber (WISDF) in rye had a magnificant positive correlation with growing time ($r = 0.655^{xx}$) and with protein content ($r = 0.733^{xxx}$). Significant positive correlation was also found between total dietary fiber (TDF) content in rye and growing time ($r = 0.542^{xxx}$) on protein content ($r = 0.681^{xxx}$). Falling number showed a negative correlation with WISDF content $C r = -0.59^{xx}$ and with

TDF ($r = -0.652^{**}$). Environmental factors and a great influence on the TDF in rye samples. PHR

Wheat

- 1486 Neuman (MR), Sapirstein (HD), Shwedyk (E) and Bushuk (W). Wheat grain colour analysis by digital image processing. I. Methodology. *Journal of Cereal Science* 10(3); 1989; 175-182
- 1487 Neuman (MR), Sapirstein (Hd), Shwedyk (F) and Bushuk (W). Wheat grain colour analysis by digital image processing. II. Wheat class description. *Journal of Cereal Science* 10(3); 1989; 183-188
- 1488 Ramzan (M), Chahal (BS), Judge (BK) and Chawla (RP). Comparative evaluation of toxicity of synthetic pyrethroids on wheat grains against the larvae of Khapra beetle, *Trogoderma granarium* Evert (Col: Dermestidae). *Bulletin of Grain Technology* 27(3); 1989; 192-195

Four synthetic pyrethroids (deltamethrin, fenvalerate, cypermethrin and fenpropathrin) each at 2, 4 and 8 p.p.m. were evaluated and compared with standard malathion 125 p.p.m. by mixing with wheat grains. The toxicity of chem. against the third instar larvae of *T. granarium* was assessed by releasing 10 larvae per jar immediately after treatment and thereafter at 1, 2, 4 and 6 months intervals. Mortality data were recorded after 15 days of release of larvae. The results of bioassay showed that all the synthetic pyrethroids except fenpropathrin caused mortality between 46.7 and 86.8% of the third instar larvae of *T. granarium*. Malathion was the least toxic insecticide at the standard dosage of 125 p.p.m. SRA

- 1489 Singh (JK), Dhaliwal (YS), Nagi (HPS) and Sekhon (KS). Laboratory sprout damage in relation to the quality of milled and baked products from Durum wheat and triticale. *Bulletin of Grain Technology* 27(2); 1989; 124-132

Commercial cv. of triticale (TL 419) and durum wheat (PBW-34) procured from Plant Breeding Department of the University were water soaked at 30 °C for 8 h and germinated at 30 °C (75% R.H.) for 24 and 48 h; the sample was heated at 80 °C for 15 min and dried to get 12% moisture and used for milling and baking studies. Results showed that in 48 h sprouted wheat, no deteriorative effect on milling was observed; ash content of flours was low in sprouted grains. Increased amylolytic and proteolytic activity of sprouted wheat injured the starch and protein quality. Poor rheological properties were observed with sprouting. Baking showed some improvement in bread vol. and cookie top score. Chapathi making quality was lowered. Heat treatment of sprouted grains showed no

improvement in milling and baking properties. SRA

Wheat flour

- 1490 Datta (JM). Quality flour requirements for bakery products. *Indian Miller* 20(4); 1990; 50, 52, 54, 56

The author points out that under Indian marketing system the bakeries are not getting the required quality wheat and flour. The sub-standard grain results mainly due to the presence of water soaked grains and the bread prepared will have weak crumb and less tasty. The author describes the quality of a good flour for bakery purposes and elaborates how these could be quantified with analytical data. KAR

MILLETS

Corn

- 1491 Elgun (A), Ertugay (Z) and Certel (M). Corn bulgur. Effects of corn maturation stage and cooking form on bulgur-making parameters and physical and chemical properties of bulgur products. *Cereal Chemistry* 67(1); 1990; 1-6

Effects of the maturation stage (milk, yellow, or ripe) and cooking form (on the cob or shelled) of Narman sweet corn on some selected parameters obtained in the bulgur-making process were studied, and physical and chemical properties of corn bulgur products were examined. The results obtained at statistically significant levels ($P < 0.05$) are as follows. During cooking below 95 °C for approx. 60 min, there was an increase in the dry matter content and colour intensity of cooking wastewater. As the grain matured, the amount of material diffused into the cooking wastewater decreased. The yellow stage corn provided the hardest and most vitreous endosperm texture to the bulgur after drying and showed the highest resistance to grinding, whereas the milky stage corn bulgur showed the lowest resistance. On a raw material basis, the yields of the pilav bulgur (< 0.5 mm) and total bulgur (> 0.5 mm) increased sharply with grain maturation, especially in the ripe stage. In either total or yellow colour intensity of the bulgur fractions, the yellow stage corn bulgur showed the highest values with amberlike yellowness and brightness. Increasing particle size from the bulgur flour (0.5 mm) to the pilav bulgur (> 1.5 mm) increased the colour intensity. Ash, fiber, and protein contents of the all bulgurs decreased with maturation, but fat content increased. In general, the finer the corn bulgur fraction, the higher the ash, fiber, protein, and fat contents. In conclusion, the best stages were yellow corn for bulgur colour, appearance, and functionality; milky

corn for nutritional value; and ripe corn for bulgur yield.
AS

- 1492 Gupta (HO), Om Prakash and Singh (J). Influence of endosperm texture of milling, chemical composition and nutritive quality in maize. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(3); 1989; 235-243

Three maize var. namely 'Vijay', 'SO/SN' composite and 'Shakti', which differ in their nutritional quality and endosperm texture were processed to prepare semolina (sooji) and process-flour. The nutritional quality of these products was determined and compared with whole kernel flour of the respective var. Distinct differences in milling and chem. comp. of three var. were recorded. In quality evaluation tests lysine and tryptophan content, biological value and true digestibility were better in semolina and process-flour. Moreover, decrease in acid value in semolina and process-flour compared with whole maize flour recorded in all the var. suggested improvement in shelf-life. AS

- 1493 Meuser (F), Wittig (J) and Huster (H). Effects of high pressure disintegration of steeped maize grits on the release of starch granules from the protein matrix. *Starch/Starke* 41(6); 1989; 225-232

The horny endosperm of maize gives the greatest resistance to the mechanical disintegration of the protein matrix during starch extraction. Thus attempts were made to release the starch by wet-milling of maize grits in the value of a high-pressure homogenizer. At the same time, information was gathered on the principles involved in the structural breakdown of the endosperm components. For this purpose the influence of the valve geometry as well as the concn. and flow rate of the suspension on the particle size reduction and disintegration was examined. Using a valve specially constructed for the photographic documentation of this process step, it could be shown that the slit height of the valve predominantly determined the particle size of the wet milled product. Already after a single passage through the valve, set at slit heights between 200 and 600 μ m, 70% of the grits were reduced to particles $< 40 \mu$ m. The grits were initially between 250 and 1000 μ m in size. Scanning electron microscope photographs showed that a large fraction of the mass existed as free starch granules alongside partly intact particles of the protein matrix. Since the starch granules were of higher purity after raffination, it is assumed that the extent to which disintegration of the endopserm particles results in starch granules and protein particles as separate entities, depends not only on the particle size reduction step, but also on the different visco-elastic behaviour of the

protein matrix and the starch granules under the influence of the larger shear forces occurring in the valve. AS

Corn starch

- 1494 Mackey (KL) and Ofoli (RY). Rheological modeling of corn starch doughs at low to intermediate moisture. *Journal of Food Science* 55(2); 1990; 417-423

A generalized model for predicting the extrudate viscosity of starch based products at low to intermediate moisture content is presented. It incorporates the effects of shear rate, temp. moisture content, time-temp. history and strain history. The model was tested using corn starch dough at various moisture contents. An Instron capillary rheometer and a Baker Perkins MPF 50 D/25 co-rotating twin screw extruder were used to collect all data. Viscosity was found to be a function of cook temp. and moisture content but not cook time. Observed versus predicted viscosity gave an R^2 of 0.975 after accounting for shear rate, temp., moisture content and time-temp. history in the capillary rheometer. Extrusion tests indicated that correction for strain history was important for highly puffed extrudates. AS

- 1495 White (P), Abbas (I), Pollak (L) and Johnson (L). Intra- and interpopulation variability of thermal properties of maize starch. *Cereal Chemistry* 67(1); 1990; 70-73

The variability in thermal properties of lab.-isolated starch from five open-pollinated populations of genetically variable maize was evaluated using differential scanning calorimetry (DSC). Each population was represented by ears from four self-pollinated plants, and starch from five kernels of each ear was individually extracted and analyzed. The data among population showed significant differences ($P < 0.05$) in the DSC values of the isolated starch, suggesting differences in comp. and degree of crystallinity of the starches. The DSC values measured include peak onset, temp. range of gelatinization, and enthalpy. Further investigation was made to evaluate the variability in thermal properties of the starch among maize plants of the same population by using ears from 20 self-pollinated plants (five kernels each) of one population. Results showed significant differences among plants within the same population, indicating that genetic variability for starch structure and, this, thermal behaviour of the starch, may exist within populations. AS

Italian millets

- 1496 Naren (AP) and Virupaksha (TK). Alpha- and beta-setarins. Methionine-rich proteins of Italian millet (*Setaria italica*)

(L) Beanuv). *Cereal Chemistry* 67(1); 1990; 32-34

Differential cryoprecipitation was employed for the purification of two methionine-rich proteins, alpha-setarin and beta-setarin from the alcohol-soluble prolamin fraction (setarin II) of Italian millet flour. Both alpha-and beta-setarins were low mol. wt. polypeptides rich in S amino acids. Methionine accounted for eight residues each out of a total of 63 and 71 amino acid residues in alpha-and beta-setarin, resp. The peptide map pattern of cyanogen bromide cleared alpha-setarin suggests that the methionine residues were randomly distributed throughout the polypeptide chain. AS

Pearl millets

- 1497 Dhanker (N) and Chanhani (BM). Effect of fermentation on HCl extractability of minerals in rabadi an indigenous fermented food of India. *Journal of the Science of Food and Agriculture* 49(4); 1989; 467-472

Pearl millet flour/buttermilk mixture was fermented at 35, 40, 45 and 50 C for 3, 6 or 9 h to prepare rabadi. Fermentation at all temp. decreased phytate P, increased non-phytate P and increased HCl extractability of P, Ca, Fe, Zn and Cu; the extractability increased with an increase in the period of fermentation. The largest improvement was seen in extractability of Fe, followed by that of P, Zn, Ca and Cu. Mn extractability did not change as a results of fermentation. AS

Sorghum

- 1498 Bello (AB), Rooney (LW) and Waniska (RD). Factors affecting quality of sorghum to a thick porridge. *Cereal Chemistry* 67(1); 1990; 20-25

Sorghum cvs typical of West African and Honduran sorghums were evaluated for physical and chem. properties and quality of To (textured and solubility properties). Endosperm hardness, amount of pericarp remaining after decortication, flour particle size distribution, pH of the cooking water, and presence of nonstarch flour components affected to quality. To prepared from SC265 with corneous endosperm had the firmest texture (low penetrometer reading). To prepared from NSA 740 with floury endosperm had the softest texture (high penetrometer reading). To prepared from ground, decorticated grain was firmer than to prepared from ground, whole grain. Thus, the pericarp adversely affected to texture, regardless of grain hardness. In general, acidic to (pH 4.6) was the most firm, whereas alkaline to (pH 8.6) had the softest

texture. The amount of soluble solids in to ranged from 30 to 57%. Firmer to contained less soluble solids. Higher pH of the cooking water increased soluble solids in to from 32-34% for acidic to to 39-47% for alkaline to. To prepared from isolated sorghum starch ($< 45 \mu m$) was of equal or better quality and contained less soluble solids than to prepared from sorghum flours containing particles $< 250 \mu m$ or $< 425 \mu m$. To prepared from flours containing more ash was of poor quality and contained higher amounts of soluble solids. Thus, kernel and flour characteristics, the chem. constituents, in sorghum, and the amounts of soluble and insoluble solids in to affected sorghum to quality. AS

- 1499 Hassan Shazali (ME). Analysis of some factors involved in competition between *Sitotroga cerealella* (Oliv.) and *Sitophilus oryzae* (L.) on stored sorghum. *Bulletin of Grain Technology* 27(3); 1989; 174-180

The exp. was designed to explain the factors which affect the competitive outcome between the moth, *Sitotroga cerealella* and the weevil, *Sitophilus oryzae* in stored sorghum. A local commercial sorghum var. was used and 1-day old moths and 1-2 wk old weevils were used. The study was aimed to find out the (i) effect of earlier infestation of grain, (ii) oviposition of *S. oryzae* on grain containing larvae and pupae of *S. cerealella*, (iii) effect of *S. oryzae* adult on the mortality of late larvae and pupae of *S. cerealella* and (iv) extent of development of *S. cerealella* and *S. oryzae* on damaged grain. The results show that the weevil of *S. oryzae* was significantly reduced when introduced simultaneously or after the moth was introduced, but remained unaffected when it gained prior access to the grain. The presence of the moth larvae and pupae within the grain significantly reduced the weevil oviposition rate. The weevil was also unable to develop in used or ground grain. However, the mortality of the moth larvae and pupae caused by feeding activity of the adult weevil, increased with increase in the number of weevil per grain. It is concluded that the weevil was adversely affected when it was with *S. cerealella*. SRA

- 1500 Ratna Sudhakar (T), Sreerama Murthy (K) and Kirshna Rao (V). Varietal differences in susceptibility of sorghum to *Rhizopertha dominica* Fab. during storage. *Bulletin of Grain Technology* 27(2); 1989; 145-157

17 sorghum var. were tested for susceptibility to *R. dominica* by calculating the susceptibility index, ash and protein contents. The results indicate that on the basis of mean number of adults emerged and mean developmental period, the susceptibility of sorghum var. varied from var. to var. but were statistically non-significant. Higher number of

adults emerged from CSH 9 (16.5) followed by PJ 895 (10.5) and least from CSH 6 (5.0). The developmental period of the test insect varied from 40.1 to 44.4 days depending upon var. The index of susceptibility was the highest for CSH 9 (6.4) and the least for Mahaboob nagar local (3.4). The differences among var. are not significant. SRA

PULSES

- 1501 Gujska (E) and Khalil Khan. Effect of temperature on properties of extrudates from high starch fractions of navy, pinto and garbanzo beans. *Journal of Food Science* 55(2); 1990; 466-469

High starch fraction (HSF) isolated from three legumes were extruded at different temp. Extruded products were evaluated for expansion, density, colour and some functional properties. The highest value of expansion was noted for pinto bean, and the lowest for garbanzo, extruded at 132 C. Extrudates from HSF expanded significantly ($P < 0.05$) less than corn extrudates. Oil absorption capacity increased slightly with increasing temp. and values were lower for navy and garbanzo beans than for pinto HSF and corn. Oil emulsification capacity of bean samples was about two times higher compared to corn. Water absorption index (WAI) of pinto and navy beans significantly increased ($P < 0.05$) from 110 to 132 C. AS

- 1502 Kataria (A), Chauhan (BM) and Punia (D). Antinutrients in amphidiploids (black gram x mung bean). Varietal differences and effect of domestic processing and cooking. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(3); 1989; 257-266

Phytic acid, saponin and polyphenol contents in grains of various var. of black gram (*Vigna mungo*) mung bean (*Vigna radiata* L) amphidiploids ranged from 697 to 750, 2746 to 2972 and 702 to 783 mg/100 g, resp. Domestic processing and cooking methods including soaking, ordinary and pressure cooking of soaked and unsoaked seeds, and sprouting significantly lowered phytic acid, saponin and polyphenol contents of the amphidiploid seeds. Soaking for 18 h removed 31 to 37% of the phytic acid; the extent of removal was higher with long periods of soaking. Saponins and polyphenols were relatively less affected. Loss of the antinutrients was greater when soaked instead of unsoaked seeds were cooked. Pressure cooking had a greater effect than ordinary cooking. Antinutrient concn. declined following sprouting; the longer the period of germination the greater was the reduction. AS

- 1503 Singh (U). Antinutritional factors of chickpea and pigeonpea and their removal by processing. *Qualitas Plantarum - Plants Foods for Human Nutrition* 38(3); 1988; 251-361

Protease inhibitors, amylase inhibitors, phytolectins, polyphenols, and oligosaccharides are important antinutritional factors of chickpea and pigeonpea. Research on these factors is reviewed and compared to those in other grain legumes. Both chickpea and pigeonpea are consumed in various forms as processed food. The effects of such processing practices as cooking, germination, and fermentation to reduce the levels of these antinutritional factors are also discussed. AS

- 1504 Ziena (HM), Abdel-Aal (MH) and Youssef (MM). Formulation and characteristics of new recipes of Egyptian pattibbeans (Falafel). *Qualitas Plantarum - Plants Foods for Human Nutrition* 38(3); 1988; 225-234

New recipes of Falafel were formulated and evaluated regarding acceptability, proximate chem. comp. and nutritive value. Soybean meal and/or cotyledons were used to substitute for faba bean at different levels (i.e, 0%, 20%, 40%, 60% 80% and 100%. Data indicated that blends of faba bean (20%) and soybean meal and/or cotyledons (80%) were the most acceptable recipes compared to the control (100% faba bean) as well as the other substitution levels. Blending soybean with faba bean led to appreciable improvement in some essential amino acids. The *in vitro* digestibility for soybean blends were comparable to the control. AS

Beans

- 1505 Hernandez-Unzon (HY) and Ortega-Delgado (ML). Phytic acid in stored common bean seeds (*Phaseolus vulgaris* L.). *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(3); 1989; 209-221

Four var. of common bean seeds stored at 4 C, 80% relative humidity, for 1-8 yrs showed no differences in proximal chemical comp. seeds 5-6 yrs old absorbed more water than 1 to 4 yr old seeds. The cooking time required for 5 yrs old seeds was 6 h while the fresh seeds needed 3/4-to-one h cooking time. The most remarkable differences was in phytic acid content, which decreased to 94% to from 98% during long storage. AS

Bengal gram

- 1506 Choudhary (BS) and Pathak (SC). Relative preference of

Callosobruchus chinensis (Linn) for different varieties of Bengal gram. **Bulletin of Grain Technology** 27(3); 1989; 181-187

Bengal gram var. ('JG-1', 'JG-5', 'JG-12', 'G-130', 'JG-1261', 'JG-74', 'JG-70-18', 'JG-315') were fumigated and after 24 h exposure kept outside for complete aeration, and later stored in jars; the wt. per 100 seeds of different var. were recorded. The beetles used were emerged from culture and were aged < 24 h. The exp. was conducted at temp. of 29.4 C and R. H. of 98.8% with the beetles of the initial exp. and 27.7 C and 96.6% R.H. with beetles of repeat exp. Out of the 8 var. 'JG-74' and 'JG-79-18' were least preferred/susceptible while var. 'JG-12' is the most preferred/susceptible to **Callosobruchus chinensis** Linn. However 'G-130' was less preferred than other var. SRA

Broad beans

- 1507 Suchkov (VV), Popello (IA), Grinberg (VY) and Tolstogusov (VB). Isolation and purification of 7S and 11S globulins from broad beans and peas. **Journal of Agricultural and Food Chemistry** 38(1); 1990; 92-95

A simple and effective preparation technique for isolation of 7S and 11S globulins from broad beans and pea seeds has been developed. It is based on differential solubility of 7S and 11S globulins in NaCl solution at pH 4.8 and at 5 and 20 C. The method makes it possible to isolate 6 g of 11 S and 1 g of 7S globulins from 100 g of broad bean meal or 1.5 g of 11S and 2 g of 7S globulins from 100 g of pea meal, with only low centrifugation. If necessary, the admixture of 15S component in 11S globulin preparations can be removed by gel chromatography on Sepharose CL-6B. AS

Chick peas

- 1508 Duhan (A), Chauhan (BM), Punia (D) and Kapoor (AC). Phytic acid content of chickpea (*Cicer arietinum*) and black gram (*Vigna mungo*). Varietal differences and effect of domestic processing and cooking methods. **Journal of the Science of Food and Agriculture** 49(4); 1989; 449-455

Phytic acid was lowered significantly by the common methods of domestic processing and cooking including soaking, cooking, autoclaving and sprouting of chickpea and black gram. Sprouting had the marked phytic acid lowering effect followed by autoclaving and soaking. Soaked seeds when cooked lowered phytic acid by 20-26% in chick pea and 35-40% in black gram grains, whereas the loss was 7-11% and 6-9% in these pulses, resp., when unsoaked seeds were cooked. SRA

- 1509 Singal (SK), Mehla (JC) and Zile Singh. Comparative resistance of genotypes of chick pea, *Cicer arietinum* (L.) to pulse beetle, *Callosobruchus chinensis* (L.). *Bulletin of Grain Technology* 27(2); 1989; 113-117

Forty five chick pea genotypes were tested for resistance to *Callosobruchus chinensis*. On the basis of per cent adult emergence and growth index as a combined criterion, the genotypes H-85-57, H-85-33, H-85-49, H-83-55, H-85-52, H-84-12 were least susceptible and the remaining genotypes were either highly susceptible or moderately susceptible. Differences in oviposition, average development period, per cent adult emergence, loss in wt. and growth index in different genotypes were significant. SRA

Cowpeas

- 1510 Aletor (VA) and Aladetimi (OO). Compositional evaluation of some cowpea varieties and some underutilized edible legumes in Nigeria. *Die Nahrung* 33(10); 1989; 999-1007

The nutritive potentials of some cowpea var. such as 'Ife Brown', Ife 'Bimpe', 'IT84E-0124', 'K59' and 'TVX716' and some under utilized edible legumes grown in Nigeria such as pigeon pea (*Cajanus cajan*), lima bean (*Phaseolus lunatus*), lablab bean (*Dolichos lablab*), mucuna bean (*Mucuna* sp.) and *Sphenostilis sternocarpa* have been evaluated with respect to their proximate chem. comp., mineral content and some endogenous toxic constituents. The cowpea var. contained on the average 22.5 g crude protein (CP), 2.60 g crude fibre (CF), 5.89 g ether extract (EE) and 3.36 g ash/100 g DM while the under-utilized legumes contained 21.7, 6.10, 2.86 and 3.56 g/100 g DM for CP, CF, EE and ash resp. Distinct varietal differences were observed for EE values as indicated by the coeff. of variation (CV) of 102% for cowpea and 60.8% for the under utilized legumes. The CF content of the under-utilized legumes were generally higher than those of the cowpea var. Potassium was the most abundant mineral in both the cowpea var. and the under-utilized legumes with mean values of 1.45 and 1.66% resp., while P was the least abundant with 13.1 and 8.50 p.p.m. resp. There were marketed intra-varietal differences in the P content as shown by the high CV of 84.0 and 73.9% for the cowpea var. and the other legumes. The cowpea var. generally had higher levels of thioglucosides: 3.86% of TIA: 13.9 mg/g protein and of haemagglutinating activity: 13.0 HU/mg N resp., than the under-utilized legumes with mean respective values of 1.22%, 9.84 mg/g protein and 22.7 HU/mg N. The nutritional implications of these anti-nutritional components were discussed and some reasons adduced for the under utilization of some of these legumes inspite of their apparent similarity in nutritional quality to the more

commonly consumed grain legumes. AS

Cowpea pastes

- 1511 Hung (YC) and McWatters (KH). Effect of holding time on the functionality of cowpea paste and quality of akara. *Journal of Food Science* 55(2); 1990; 558-559

Whipped cowpea pastes were held at room temp. (20 C) for 0, 30, 60, 120, and 240 min before preparation of akara (fried cowpea paste). Apparent viscosity of whipped paste was measured at different shear rates (0.17, 0.34, 0.85, 1.70, 3.40, 6.80, and 17.00 sec⁻¹). At any given shear rate, paste became more viscous with increasing holding time. Akara became darker and less yellow in colour as paste holding time increased. Akara made from paste held 120 min or longer had an unacceptably dense, firm texture. AS

Dry beans

- 1512 Hernandez-Unzon (HY) and Ortega-Delgado (ML). Denaturation by heat, sodium dodecyl sulphate and dithiothreitol of globulins and phaseolin from dry bean (*Phaseolus vulgaris* L.). *Qualitas Plantarum - Plants Foods for Human Nutrition* 38(3); 1988; 211-223

The electrophoretic pattern of the untreated common bean globulin cv. Flor de Mayo had 7 protein fractions ranging from 620 to 120 kilodaltons (Kd). The last mol. wt. corresponds to the monomeric form. One of the objectives of the present work was to establish a comparison among denaturation by heat, sodium dodecyl sulphate (SDS) and dithiothreitol (DTT). At pH 6.0, two bands were resistant to heat treatment, after SDS treatment of the untreated globulin several bands disappeared and two new bands with 26 and 15 kd appeared. DTT did not change the electrophoretic pattern, due to the small quantity of free SH groups in the globulin. At pH 6.0, phaseolin is partially resistant to heat denaturation due to aggregation in an acidic environment. Isoelectrofocusing (IEF) and SDS polyacrylamide gel electrophoresis (SDS-PAGE) separated phaseolin into 10 protein fractions. The hypothesis is that phaseolin or globulin aggregation is due to the charge difference of fractions. AS

Faba beans

- 1513 Abd Allah (MA), Foda (YH), Abu Salem (FM) and Abd Allah (ZS). Treatments for reducing total vicine in Egyptian faba bean ('Giza 2' variety). *Qualitas Plantarum - Plants Foods for Human Nutrition* 38(3); 1988; 201-210

The response of faba bean *Vicia faba* ('Giza 2' var.) towards soaking conditions differed greatly since the absorbed quantities of water (either by the whole or the decorticated forms) are a function of their chem. constituents. On the other hand, 28.45% of the total vicine (vicine + convicine) present in the whole faba bean samples was extracted after soaking for 72 h at room temp. Subsequently, other soaking mediums, i.e., 0.5% sodium carbonate and/or 1% acetic acid were used in an attempt to increase the level of vicine elimination. Percentage removal of total vicine in whole faba bean was higher in the acidic (61.31%) than the alkaline (38.40%) medium under the conditions tested i.e., at room temp. for 72 h. The rates of vicine + convicine elimination in decorticated faba bean for the acidic acid and alkaline soaking media were 78.46 and 79.13% resp. The solubility ratio of total vicine relative to soaking solutions (hydrogen peroxide:sodium carbonate:Acetic acid) was 1:1.35:2.16 in the whole broad bean and 1:2.41:2.39 in the decorticated samples. The residual amounts of total vicine (78.33% and 77/27%) present after stewing under normal and under pressure cooking conditions could be expected to be decreased to 30.33% for the former and 29.92% for the later after 72 h of soaking. Regression analysis was used to estimate the theoretical zero point of vicine elimination from faba bean through soaking in 1% acetic acid. AS

Field beans

- 1514 Parsai (SK), Rawat (RR) and Choudhary (RK). Ovipositional behaviour and preference of the bean beetle, *Callosobruchus phaseoli* (Gyllenhal): Its extent of damage in stored seeds of different varieties of field bean. *Bulletin of Grain Technology* 27(2); 1989; 103-106

Ovipositional behaviour and extent of damage caused by *Cal. phaseoli* in different var. of field beans was studied at Jabalpur, Madhya Pradesh, India. The seed damage in different var. of field beans after storage for about 3 1/2 months ranged from 0.00 to 93.33%. Based on the extent of seed damage, 42 var. were grouped as highly susceptible, 33 moderately susceptible, 73 susceptible and one (JDL-122) var. not susceptible/resistant. SRA

Green gram

- 1515 Choudhary (BS), Rawat (RR) and Pathak (SC). Relative preference of *Callosobruchus chinensis* (Linn) for different varieties of green gram. *Bulletin of Grain Technology* 27(2); 1989; 107-112

Healthy and insect free seeds of seven var. ('PS-16',

'Pusa-105', 'J-45', 'Pusa-101', 'Kopergone', 'Khargone-1' and 'Pusa baishaki') of green gram were fumigated with aluminium phosphide tablets. 200 g of seed of each var. was taken in a glass jar and 20 beetles were released in each jar and the data on mean oviposition; mean % survival; mean developmental period; mean seed damage and mean size of adult beetles were recorded. After 24 h of fumigation, the seeds were aerated. The exp. were conducted in a room having av. temp. of 26.7, 23.7 C and R.H. of 72% and 69.2%. The result shows that var. 'Kopergaon' appeared to be the most preferred/susceptible and 'J-45' was least preferred and least susceptible for development and survival of *Callosobruchus chinensis*. SRA

- 1516 Singh (S) and Yadav (TD). Efficacy of methoprene against *Callosobruchus maculatus* (Fab.) and *C. chinensis* (Linn.) infesting green gram. *Bulletin of Grain Technology* 27(2); 1989; 169-173

Methoprene was tested at 1, 5, 10 and 15 p.p.m. levels against *Callosobruchus maculatus* (Fab.) and *C. chinensis* (Linn). in stored green gram over a test period of 12 months. 100 g seeds of green gram was kept in small bottles, and two pairs of freshly emerged *C. maculatus* and *C. chinensis* were released and incubated at 27 plus or minus 1.5 C and 60% R.H. The observation on the progeny development was taken after 1, 3 and 6 months. Data show that 1 p.p.m. was not effective against *C. chinensis*, but 5, 10 and 15 p.p.m. were moderately effective for 3 months only. For *C. maculatus* 10 and 15 p.p.m. caused 100% mortality upto 3 months and at the end of 12 months, 67.0 and 85.7% mortality was observed at the respective doses. Oviposition in both the insects was not affected, but morphological deformity was observed in the adults of *C. maculatus*. A dose of 15 p.p.m. exhibited high residual toxicity during 6 months for both the sp. SRA

Locust beans

- 1517 Odunfa (SA) and Komolafe (OB). Nutritional characteristics of *Staphylococcus* species from fermenting African locust bean (*Parkia biglobosa*). *Die Nahrung* 33(7); 1989; 607-615

The *Staphylococcus* sp. from fermenting African locust bean include *S. xylosus* (55%) *S. saprophyticus* (33%) and *S. hominis* (11%). All the sp. had optimum growth at a temp. range of 30-35 C and pH of 6-8. Max. growth was attained at 18 h. All the isolates were coagulase negative. The vitamin and amino acid requirements of *Staphylococcus* strains were determined in broth culture using defined media. All the strains investigated had no absolute requirement for amino acids and vitamins used in the study. However, many amino acids including methionine, leucine, alanine and glycine stimulated

growth. Aspartic acid, leucine and methionine were not required by a strain of *S. hominis* for growth while a strain of *S. xylosus* did not require proline. The vitamins thiamine, biotin and niacin were necessary for growth of the strains of *Staphylococcus* studied. The percentage occurrence of staphylococci of the total microbial population in fermenting locust beans increased from 0.3% at 24 h to 34% at 36 h and then to 42% at 48 h. The increase in percentage was ascribed to the release of amino acids and vitamins by the earlier microbial colonizers, *Bacillus subtilis*. AS

Lupins

- 1518 Karara (HA). Formation of protein-lipid film from lupin seed. *FAT Science Technology* 91(10); 1989; 412-416

Lupin seed can be used to produce protein-lipid films which resemble 'Yuba', a traditional soy delicacy of the Far East. The seeds are soaked in water at 22 C for 5 h and homogenized with twice the amount of water. The "milk" obtained after filtration contains 5-6% soluble solids. Lupin milk having a pH-value of 7-8 is heated to 80-85 C for 2 h. The film formed is removed with a glass rod and dried at 100 C. More than half of the dry protein-lipid-film obtained from lupinseed consists of protein, its lipid content amounts to < 10%. AS

Navy beans

- 1519 Dhurandhar (NV) and Chang (KC). Effect of cooking on firmness, trypsin inhibitors, lectins and cystine/cysteine content of navy and red kidney beans (*Phaseolus vulgaris*). *Journal of Food Science* 55(2); 1990; 470-474

The effect of cooking on firmness, trypsin inhibitor (TI) and lectin activities, and cystine/cysteine (Cys) of navy and red kidney beans was investigated. Beans were soaked and cooked in an open-kettle at various temp. and periods. Navy beans canned by two methods were used for comparisons with the open-kettle cooked beans. The TI activity, lectin activity and Cys content decreased with increasing temp. and/or period. Under some of the cooking conditions, < 5.5% and 0.1% of TI and lectin activities, resp. were retained, though the firmness of beans was palatable. Canned navy beans did not have lectin activity but had < 5% residual TI activity. AS

Peas

- 1520 Bacon (JR), Noel (TR) and Wright (DJ). Studies on the thermal behaviour of pea (*Pisum sativum*) vicilin. *Journal of the Science of Food and Agriculture* 49(3); 1989; 335-345

The effect of heat on pea (*Pisum sativum* L) vicilin has been studied using differential scanning calorimetry (DSC), gel filtration chromatography and turbidimetry. By adjusting the variables of pH, ionic strength and protein concn. two processes could be identified from the DSC thermograms; protein denaturation and protein aggregation. The results are discussed in terms of electrostatic and hydrophobic interactions. A mechanism for the thermal aggregation of pea vicilin is proposed. AS

- 1521 Renu and Leena Bhattacharya. Proximate composition of improved genotypes of peas (*Pisum sativum*). *Bulletin of Grain Technology* 27(2); 1989; 118-123

Ten improved genotypes of peas ('Pant P 3-1', 'Pant P4', 'Pant P5', 'Pant P 81-10', 'Pusa 10', 'KPSD 1', 'L 116', 'EC 33866', 'T 163' and 'Rachna') were analysed for crude fibre, total ash, crude protein, crude fat, carbohydrates and energy. Crude protein content ranged from 15.00 (released var.) to 29.37% (pre-release var). Significant and negative correlation was observed between carbohydrate and crude protein content of the var. SRA

Pigeon peas

- 1522 Khaire (VM), Kachare (BV) and Patil (CS). Studies on vegetable oils and their effect on ovipositional preference of *Callosobruchus chinensis* L. on pigeon pea. *Bulletin of Grain Technology* 27(2); 1989; 151-152

Pigeon peas seeds were treated separately with 10 vegetable oils (sunflower oil, castor oil, mustard oil, safflower oil, groundnut oil, palm oil, sesame oil, neem oil, Karanj oil and corn oil) at 0.5, 0.75 and 1.0 concn. and one day adult of *C. chinensis* were released. All the oil treatments showed significant adverse effect on ovipositional preference. The average number of eggs laid on 50 seeds ranged from 24.33 to 118.66 in different treatments. Neem oil and Karanj oil (at 1.0%) were on par with 1.0% level castor oil and are significantly superior to other treatments. SRA

Yellow peas

- 1523 Horvath (E), Ormai-Cserhalmi (Z) and Czukor (B). Functional properties of air-classified yellow pea (*Pisum sativum*) fractions. *Journal of the Science of Food and Agriculture* 49(4); 1989; 493-497

The present investigation is the characterisation of yellow pea (*Pisum sativum*) fractions obtained on a commercial

scale by air classification of the milled peas. Some analytical aspects of the process are investigated including particle size distribution of fractions and their functional properties. SRA

OILSEEDS AND NUTS

Brazil nuts

- 1524 Weller (DL). The 7S protein from Brazil nut. *Journal of Food Biochemistry* 13(5); 1989; 353-360

The 7S (6.2S) protein of Brazil nut (*Bertholletia excelsa*) was isolated by ammonium sulphate solubilization from a .high mol. wt. fraction which contained primarily the major 11S (10.5S) nut globulin excelsin. Electrophoretic characterization of the protein showed that, in addition to sedimenting more slowly, it differed from excelsin in size, being smaller, and in subunit comp. AS

Pentacletra macrophylla

- 1525 Nioku (HO) and Okemadu (PO). Biochemical changes during the natural fermentation of the African oil bean (*Pentacletra macrophylla*) for production of Ugba. *Journal of the Science of Food and Agriculture* 49(4); 1989; 457-465

This study was undertaken to investigate the enzymes considered relevant to the fermentation of African oilbean for the production of Ugba and to relate them to changes observed in chem. comp. Alpha-amylase, proteolytic and lipolytic enzyme activity remained detectable throughout the 72 h fermentation period, and reached a max. at 24-36 h. The levels of amino-nitrogen, ammonia nitrogen, reducing sugar, titratable acidity and pH increased with time. A seven-fold increase in the amino-nitrogen level occurred during the fermentation. The temp. of the fermentation and moisture level reached max. values at 24 h and 48 h of fermentation resp. These results could provide useful indices for the improved evaluation of Ugba fermentation. SRA

Rapeseeds

- 1526 Campbell (LD) and Slominski (BA). Extent of thermal decomposition of indole glucosinolates during the processing of canola seed. *Journal of the American Oil Chemist's Society* 67(2); 1990; 73-75

Samples representing various stages of processing viz;

seed, flakes, cooked flakes, expelled cake, extracted meal, desolventised meal and dried meal were assessed for the extent of thermal degradation of indole glucosinolates. Only minor decomposition of indole glucosinolates was evident prior to the desolventisation stage. Major decomposition occurred in the desolventisation stage of processing in oleacetoneitriles and thiocyanate (SCN) together accounted 45-60% of the degraded indoles in the samples studied. MNK

- 1527 Cenkowski (S), Muir (WE) and Jayas (DS). Simulation of canola and barley drying in a deep bed. *Journal of Food Process Engineering* 12(3); 1990; 171-190

A mathematical model for a radial, continuous-crossflow dryer was modified and used to simulate the drying process in a fixed bed dryer. The predictions of the adapted model were compared with experimental test results for canola drying at the following drying conditions: airflow rates of 0.4 and 0.6 kg/(m² S), inlet air humidity 0.098 and 0.0114 kg/kg of dry air, initial grain moisture content 0.221 and 0.251 kg/kg dry basis. In both tests the inlet drying air temp. was kept at an av. of 67.5 C. At the end of canola drying, the mean drying air temp. predicted by our model was within 1 C of the measured temp. and the mean predicted moisture content was within 0.5% of the measured moisture content, dry basis. Also, our model was verified against experimental results for barley published by other authors and against predictions from a published model for barley. The predictions from our model were in good agreement with the published experimental and predicted data. Simulations results for canola and barley drying in the same thickness of a deep bed were compared. Simulations were conducted to investigate the effects of canola properties such as bulk density and drying conditions of air such as airflow rate and air humidity on drying in deep beds of canola. AS

- 1528 Evans (EJ), Bilsborrow (P), Grant (A), Kwiatkowska (CH), Spinks (EA), Heaney (RK) and Fenwick (GR). A comparison of rapid- (X-ray fluorescence, near infrared reflectance) and glucose-release methods for the determination of the glucosinolate content of oilseed rape (*Brassica oleracea*). *Journal of the Science of Food and Agriculture* 49(3); 1989; 297-305

Rapeseed (*Brassica oleracea* L) samples representing the wide range of glucosinolate contents typical of both 'single-low' and 'double-low' var. grown in the UK were analyzed by X-ray fluorescence and by near-infrared reflectance spectroscopy, currently considered to be alternatives for the rapid analysis of glucosinolates in rapeseed. Each physico-chemical technique was compared with an established method

based on the enzymic release of glucose. The results of such intercomparisons are reported and the relative advantages and disadvantages of the methods are discussed. AS

- 1529 Gueguen (J), Bollecker (S), Schwenke (KD) and Raab (B). Effect of succinylation on some physicochemical and functional properties of the 12S storage protein from rapeseed (*Brassica napus*. L.). *Journal of Agricultural and Food Chemistry* 38(1); 1990; 61-69

The physicochemical and functional properties of the native and succinylated 12S storage protein from rapeseed have been studied and found to depend on the degree of modification. Ultracentrifugation and isoelectric focusing were used for the characterization of the protein samples. The functionality was studied through adsorption kinetics at air/water interfaces and foaming and emulsifying properties. Succinylation results in a significant change of the interface adsorption kinetics of the native rapeseed globulin and in an improvement of foam capacity and stability as well as emulsion stability. These effects, greatly influenced by the level of succinylation, are discussed as being related to the dissociation of the oligomeric 12S globulin into subunits, to the unfolding of these subunits, and to the charge variations, depending on the degree of modification. AS

- 1530 Schwenke (KD), Raab (B), Pahtz (W), Zirwer (D) and Hak (KY). Modification of the low-molecular weight basic albumin fraction from rapeseed (*Brassica napus* L) by acetylation. Part I. *Journal of Food Biochemistry* 13(5); 1989; 321-334 (Ch).

The chem. and physicochemical changes of the low-mol. wt. basic albumin fraction from rapeseed, as a function of degree of acetylation, were studied using amino- and ester groups analyses, PAGE electrophoresis, isoelectric focusing, viscometry, circular dichroism and fluorescence spectroscopy. The surface hydrophobicity was evaluated by means of the ANS fluorescence probe technique. The protein was readily acetylated at the amino- groups by addition of acetic anhydride. Acetylation of amino acid hydroxyl groups was significantly slower and proceeded in the presence of an excess of the reagent after the amino groups had already been blocked. Acetylation resulted in protein sp. with isoelectric points at pH 7.6, 6.6, 5.96, and 5.4. The intrinsic viscosity of the native protein fraction dropped from 0.159 dl g^{-1} to 0.038 dl g^{-1} at a moderate degree of modification. The secondary structure of the protein, characterized by a content of 40-45% helix conformation, was not significantly influenced by acetylation. Modification did not result in wavelength shifts of the peaks in the near ultraviolet CD and fluorescence spectra. However, the negative ellipticities in

the 250-270 nm region of the CD spectrum increased markedly, with increasing degree of acetylation. The surface hydrophobicity increased linearly with the amount of acetyl groups introduced into the protein. AS

Sesames

- 1531 Kataria (SR), Kawatra (BL) and Sadana (B). Development and acceptance of missi roti preparations supplemented with sesame seeds (*Sesamum indicum*). *Beverage and Food World* 16(2); 1989; 33-35

This study is undertaken to study the effect of supplementation of sesame seeds on the protein quality of missi roti (a preparation from a mixture consisting of wheat flour & dehusked Bengal gram flour besan). The best acceptable level of supplementation (20%) selected is similar to plain missi roti and improved the nutritional value of the preparation. The protein and amino acid comp. of the 20% sesame seed supplemented group is more as compared to plain one. SRA

Soybeans

- 1532 Aleator (VA) and Ojo (OI). Changes in differently processed soybean (*Glycine max*) and lima bean (*Phaseolus lunatus*) with particular reference to their chemical composition and their mineral and some inherent antinutritional constituents. *Die Nahrung* 33(10); 1989; 1009-1016

The effects of 3 processing techniques: cooking, roasting and autoclaving on the proximate chem. comp., the mineral content and some inherent toxic factors of soy and lima beans were investigated. The processing techniques generally reduced the crude fibre levels and enhanced the extractable fat in the soy and lima beans. The coeff. of variability for crude fibre and ether extract due to the processing techniques of soy and lima beans were 20.9%, 16.0% and 22.3%, and 38.1% resp. In parallel with decreased ash content in the cooked bean samples, there was a decrease in the K, Mg, Na and P levels relative to the raw bean and also relative to the other processing techniques. Mineral contents of the autoclaved beans samples were generally similar to those of the raw (unprocessed) samples. Under the processing conditions. AS

- 1533 Che Man (YB), Wei (L-S) and Nelson (AI). Inactivation of lipoxxygenase in whole soybeans at low pH. *ASEAN Food Journal* 4(4); 1989; 145-149

The use of low pH to inactivate lipoxxygenase in soybeans without employing heat treatment was investigated. The effect

s of acid on trypsin inhibitor, urease and protein solubility were also studied. Inactivation of lipoxxygenase was found to be irreversible when treated at pH 3.0 and below. The SDS-PAGE pattern also showed disappearance of the lipoxxygenase band when acid treated at pH 3.0 and below. Acid treatment showed no effect on trypsin inhibitor regardless of pH. Activity of urease was reduced to a commercially acceptable level (0.2 pH) at the optimum pH when lipoxxygenase was inactivated. A PDI of more than 70% was retained in the neutralized full-fat soy flour after treatment with acid at about pH 3.0. This study indicate that off-flavours in soybeans could be controlled by pH adjustment alone while retaining good protein solubility. AS

- 1534 Fernando (SM) and Murphy (PA). HPLC determination of thiamin and riboflavin in soybeans and tofu. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 163-167

A HPLC methodology has been developed to determine thiamin and riboflavin in soy products. An aqueous reversed-phase C₁₈ system with fluorescence detection was employed. Sample preparation included acid hydrolysis and an oxidation step to produce thiochrome from thiamin. Fluorescent chromatograms indicated the presence of many other fluorescing compounds in addition to the vitamins. Thus, vitamin contents of soy products are less than reported in the literature with use of the AOAC methods. Consistent recoveries of 84% for thiamin and 95% for riboflavin were routinely obtained in whole soy flour samples. The contents ranged from 6.26 to 6.85 and 0.92 to 1.10 $\mu\text{g/g}$ for thiamin and riboflavin, resp., in three soybean varieties. Examination of the vitamin distribution on the processing of tofu revealed that the ranges of retention of thiamin and riboflavin were 7.6-15.7% and 11.7-21.1%, resp. Retention of these water-soluble vitamins in tofu stored in water indicated remarkable losses due to leaching. AS

- 1535 Singh (RG) and Nirankarnath). Pretreatments of soybeans for potato-based protein rich food supplements. *International Journal of Food Science and Technology* 24(6); 1989; 665-668

A simple process for pretreatments of soybeans for use as a multi-purpose potato-based food which could be consumed as a sweetened gruel or as a fried snack is presented. BV

- 1536 Vedrina-Dragojevic (I), Sebecic (B) and Balint (L). Variability of thiamine, riboflavin and niacin content in soybean seed. *Die Nahrung* 33(10); 1989; 1017-1019

- 1537 Wang (G), Kuan (SS), Francis (OJ), Ware (GM) and Carman (AS). A simplified HPLC method for the determination of phytoestrogens in soybean and its processed products. *Journal*

of Agricultural and Food Chemistry 38(1); 1990; 185-190

By using the proposed procedure, phytoestrogens (daidzein, genistein, coumestrol) can be isolated from soybean and its processed products and subsequently quantitated by HPLC without defatting and cleanup of the samples prior to assay. The samples are extracted with acetonitrile-water, and the extract is filtered through a glass fiber filter. The analytes in the filtrate are in turn separated by HPLC on a C_{18} column and quantified by spectrometry. The method is sensitive to 2 p.p.m. of isoflavones with UV detection and 0.5 p.p.m. of coumestrol with fluorescent detection. The recoveries of phytoestrogens in spiked samples ranged between 75 and 110%. The rapidity, simplicity, and low cost of the method make feasible the assay of large numbers of samples in a regulatory lab. AS

Soy flour

- 1538 Singh (RP) and Singh (G). Use of defatted soy flour in sev preparation. *Beverage and Food World* 16(2); 1989; 22-24

Bengal gram flour (Besan) was blended with defatted soy flour at 10-30% level of sev preparation. During product preparation, the blends absorbed greater vol. of water than that of control for dough making. The frying time of products increased with the level of dough moisture. The hardness of product as well as diameter and expansion ratio increased upto 15% level of defatted soy flour and thereafter they decreased. Soy fortified products had greater % of protein, fat and ash as compared to control. Organoleptic characteristics revealed that product with 20% defatted soy flour was comparable to control in acceptability. AS

Soy products

Miso

- 1539 Okada (Y), Yamaguchi (N) and Yoshii (H). Extraction of bitter components from non-salted soybean miso. Studies on the reduction of salt concentration in fermented foods. Part XII. *Journal of Japanese Society for Food Science and Technology (Nippon Shokuhin Kogyo Gakkaishi)* 36(8); 1989; 625-630 (Ja).

Defatted non-salted soybean miso (DF-NSSM) and a water-soluble fraction (WS) of non-salted soybean miso (NSSM) were extracted by n-butanol or sec-butanol, in order to separate the bitter components. (1) the yields of n- and sec-butanol soluble fractions extracted from DF-NSSM were 10 and 13% resp., and those from WS were 16% each. (2) in the butanol soluble fraction (Bu-S), a small quantity of free and bound

type hydrophilic amino acids and a lot of hydrophobic amino acids which were in the order leucine > phenylalanine > isoleucine > valine were detected. The ratio of bound type amino acids was higher for hydrophilic amino acids and lower for hydrophobic amino acids. In the butanol insoluble fraction (Bu-Ins), a small quantity of free and bound type hydrophobic amino acids and a lot of hydrophilic amino acids were detected. The ratio of those bound types was almost the same as in the case of Bu-S. (3) It was noticed that almost all the bitter components of NSSM was contained in WS, and by butanol extraction of WS, free hydrophobic amino acids were concentrated to about 2 times those in WS, those bound types to about 4 times those in WS. AS

Soy beverages

- 1540 Kahn (R), Stehli (D), Wei (LS), Steinberg (MP) and Yamashita (N). Activity and mobility of water in sweetened concentrated desludged soy beverages and their rheological properties. *Journal of Food Science* 55(2); 1990; 537-542

Intermediate moisture soy-sugar conc. were formulated with dehulled, blanched, ground and desludged soybeans. The influence of specific sugar content and soy solids content on the activity, and NMR mobility of the water and the rheological properties of the model systems were determined. Both activity and mobility of water were strongly influenced by the moisture content but not by the soy solids content. Interactions between added sugar and soy solids contents limited the lowest water activity achievable. All samples showed non-Newtonian behaviour. The consistency coeff. was influenced by the soy content, moisture content, specific sweetener, polymer-to-solute ratio and temp. Flow behaviour index was strongly influenced by soy solids contents but not by specific sweetener and temp. AS

Soy milk yoghurts

- 1541 Buono (MA), Setser (C), Erickson (LE) and Fung (DYC). Soy milk yoghurt. Sensory evaluation and chemical measurement. *Journal of Food Science* 55(2); 1990; 528-531

Soy milk yoghurts with fortifiers, 25% fructose (SOYF), evaporated milk (SOYEM) of non-fat dry milk (SOYN), were compared for stachyose concn.; pH; sour, sweet, and beany flavour; and viscosity. Beaniness was reduced significantly compared to unfermented soymilk; SOYF had the lowest panel score. Sour flavour determined by a trained sensory panel on a 10-point intensity scale was 1.8, 7.8 and 8.0 for SOYF, SOYEM, and SOYN, resp. Mean sensory viscosity scores for these yoghurts were 4.8, 7.9, 9.0 resp. Sour flavour and

viscosity for SOYF were significantly lower than for other yoghurts. No relationship between analytical and sensory measurements of flavour were found; however, instrumental viscosity measurements were linearly related to sensory scores. AS

Soy proteins

- 1542 Zasyarkin (DV), Yurjev (VP) and Tolstoguzov (VB). Water distribution in mixtures of soy protein isolates with starch and maltodextrin. *Die Nahrung* 33(10); 1989; 949-955

Hydration of soy protein isolate and its mixture with potato starch and starch hydrolyzate is studied by the pulsed nuclear magnetic resonance method. As the water content varies between 0.05 and 3 g per gram solid, the relaxation of magnetization of proteins of studied systems is approx. by two exponents with the spin-spin relaxation times falling within the ranges 2 to 10 min and 20 to 200 min. The values of relaxation times varying from 2 to 10 min are attributed to the limited mobility of water molecules due to their interaction with the binding centers of macromolecules. Variations in the relaxation time from 20 to 200 min with increasing water content is related to the limited mobility of water molecules as a result of two successive processes, namely filling and contraction of capillaries at low moisture content and formation of a fluctuation network of interactions between macromolecules at high water contents. The hydration of soy protein isolate starch mixtures is noted for a number of features. Water is found to redistributed in mixture in a more hydrophilic component. AS

Sunflowers

- 1543 Turkulov (J), Veselinovic (S) and Dimic (E). Contribution to the investigation of chemical changes in sunflower seed during storage. *FAT Science Technology* 91(10); 1989; 391-393

The aim of the lab. investigation presented in this paper was to determine the dominant promotor of self-heating of stored sunflowerseed. The changes of two seed samples, having 7.0 and 14.2% moisture content (MC) were followed in open and closed system, and in the atm. of carbon dioxide at 20 C and 44 C during 60 days of storage. The peroxide value, MC and free fatty acids were followed. The results confirm that both MC and the temp. influence the chem. changes in the stored seed. It has been found that the hydrolytical changes flow permanently, even if the MC of the seed is 7.0%. AS

TUBERS AND VEGETABLES

Root vegetables

Onions

- 1544 Hubner (G). Onion irradiation. A case study. *Acta Alimentaria* 18(2); 1989; 211-224

Onion irradiation prevents sprouting associated with long term storage. Under the climate conditions of Central Europe, only that part of onions should be irradiated which is needed to supply the domestic market during the months of May to July. Physiological foundations of radiation-induced sprout inhibition and product-related information on cvs, on the amounts produced, and on storage losses as well as factors influencing the efficiency of onion irradiation such as the quantity of onions irradiated during the harvest period, plant size and mechanical loading factors are presented and discussed as a result of onion irradiation during a period of seven yrs. National economy and business management aspects demonstrate the advantages of onion irradiation. Two types of irradiation plants, a bulk-irradiation plant and a multipurpose large-scale irradiation plant are used for onion irradiation. Technical data, throughout, cost-related parameters of onion irradiation and benefits of the irradiation treatment are discussed. Onion irradiation for long-term storage is beneficial to the national economy as well as to the business management. AS

Tubers

Cassava

- 1545 Essers (AJA). Reducing toxicity by simple changes in the traditional preparation of cassava leaves-a small trial in Mozambique. *Tropical Science* 29(4); 1989; 269-272

An exp. on the removal of cyanide in cassava leaves has been carried out by altering the cooking time and initial water temp. in the preparation process in a small trial in Mozambique which is traditional. It was found that with water at a starting temp. of 27 C brought down the total cyanide level 3.8 times more effectively than starting with boiling water. By increasing the cooking time from 1/2 h to 1 1/2 h a 2.5 fold more effective reduction in total cyanides was noticed. BV

- 1546 Gevaudan (A), Chuzel (G), Didier (S) and Andrieu (J). Physical properties of cassava mash. *International Journal of Food Science and Technology* 24(6); 1989; 637-645

Sorption and thermophysical properties (desorption curves, density and specific heat) of native and gelatinized cassava mash and of cassava starch were determined, in order to gain a better understanding of the heat and mass-transfer phenomena involved in gari cooking and drying. Desorption isotherms of native cassava mash are given at 4 temp. from 40 to 90 C, the experimental data were described using the GAB model with a max. root mean square error (RMS) of 5%. The net desorption enthalpy, calculated from the desorption data, decrease from 902.0 to 80.2 KJ/Kg when the moisture content increases from 0.04 to 0.24 Kg of water/kg dry matter. Desorption curves are not significantly affected by the degree of gelatinization of the starch, but at constant water activity, native cassava mash has a higher equilibrium moisture content than the other samples. The density of cassava mash increases from 1239 to 1509 kg/m³ when it is dehydrated from 51.8% to 6% (wet basis), and the specific heats of dry cassava starch and dry cassava mash, determined by differential scanning calorimetry, vary linearly over the temp. range -20 C to 96 C from 1.128 to 1.760 and from 0.979 to 1.591 KJ/kg x K. AS

Cassava flour

- 1547 Essers (AJA) and Nout (MJR). The safety of dark, moulded cassava flour compared with white. A comparison of traditionally dried cassava pieces in North East Mozambique. *Tropical Science* 29(4); 1989; 261-268

In this study the relationships and processes for the manufacture of cassava dried pieces that cause higher or lower toxicity in North Eastern Mozambique have been carried out. Fresh cassava (*Manihot esculenta*) tubers were split into segments to obtain pieces with similar cyanide levels. From each root one segment was deep frozen immediately and analysed to serve as a control. The remaining segments were dried and stored for 8 months under traditional household conditions as existing in North East Mozambique. In these pieces, a varying extent of fungal growth took place. These were ground and analysed for moisture, total and free cyanide, pH, brightness, aflatoxins and the number and genus of fungal polygenes. It was found by adopting traditional method a loss of 92.3-99.5% in total cyanide was obtained whereas the free cyanide levels ranged from 19-89% of total cyanide. There was no correlation between the initial and final cyanide levels before and after drying and storage. Darker flows had lower levels of total and free cyanide levels as also higher pH without aflatoxins. This showed that the consumer safety of cassava flour cannot be judged only by colour or extent of fungal growth. BV

Chufa

- 1548 Linssen (JPH), Cozijnsen (JL) and Pilnik (W). Chufa (*Cyperus esculentus*). A new source of dietary fibre. *Journal of the Science of Food and Agriculture* 49(3); 1989; 291-296

Chufa (*Cyperus esculentus* var *Sativus* Boeck) could be a new source of dietary fibre. The total dietary fibre content of chufa is very high 19.0% (w/w) average (calculated on dry matter). The neutral sugar comp. of the dietary fibre consists mainly of glucose and xylose. The average content of phytic acid was 724 mg/100 g. AS

Potatoes

- 1549 Mehta (A) and Kaul (HN). High temperature storage of potato (*Solanum tuberosum* L.) for processing-a feasibility study. *Qualitas Plantarum - Plants Foods for Human Nutrition* 38(3); 1988; 263-268

Tubers of three potato cvs were stored at room temp.; (20-39 C, 30-75% RH), under an insulated storage run on passive evaporative cooling (16-30 C, 70-90% RH) and a refrigerated storage (2-4 C, 90-95% RH) for 14 wks and studied periodically for storage losses, reducing sugar content and dry matter percent of tubers, in order to explore the possibility of storing potatoes for processing at higher temp. Physiological losses in tubers remained less than 10% until 12 wks of storage under evaporatively cooled storage. Reducing sugar contents increased by only 52.4%-242.1% in tubers stored in evaporatively cooled storage as compared to 90.5-484.2% increase in tubers stored in refrigerated storage until 14 wks. Potatoes stored in evaporatively cooled store were more suitable for processing into chips and french fries due to lower physiological losses and lower reducing sugar content of tubers. AS

Potato starch

- 1550 Yakubu (PI), Baianu (IC) and Orr (PH). Unique hydration behaviour of potato starch as determined by deuterium nuclear magnetic resonance. *Journal of Food Science* 55(2); 1990; 458-461

Deuterium nuclear magnetic resonance (NMR) measurements at 4.7 Tesla revealed a unique hydration behaviour of potato starch that involved the presence of a tightly bound water population with anisotropic motions within the potato starch granule, even in the presence of excess, bulk water in potato starch slurries. Well-defined powder patterns with residual deuterium quadrupole splittings of about 1 kHz were also

observed at 20 C for raw potato tubers. Three other water populations, a weakly bound, a surface-trapped, and a bulk water population, were also present up to 60% starch and were in fast exchange with each other at room temp., resulting in a broadened, single Lorentzian ^1H NMR peak. These three water populations were absent below 35% moisture content in potato starch, but not in corn starch. The unique hydration properties of potato starch might be important for novel processing methodology. AS

Vegetables

- 1551 Berrang (ME), Brackett (RE) and Beuchat (LR). Growth of *Listeria monocytogenes* on fresh vegetables stored under controlled atmosphere. *Journal of Food Protection* 52(10); 1989; 702-705

The effects of controlled atm. storage (CAS) on survival and growth of *Listeria monocytogenes* on fresh asparagus, broccoli, and cauliflower were investigated. Vegetables were inoculated with *L. monocytogenes* strain Scott A or LCDC 81-861 (10^3 - 10^5 CFU/g) and stored at 4 and 15 C under CAS and air. *L. monocytogenes* population were monitored over 21 day (4 C) and 10 day (15 C) periods using selective recovery media and a direct plating technique. CAS lengthened the time that all vegetables were considered acceptable for consumption by subjective inspection. Populations of *L. monocytogenes* increased during storage but CAS did not influence the rate of growth. AS

- 1552 Mohr (K-H) and Skork (S). On the cooking kinetic of vegetable products. *Die Nahrung* 33(10); 1989; 975-981 (De).

This paper includes kinetic studies on cooking of solid vegetable products with consideration of the instationary product heating. The cooking value C_0 as a quality determining feature for solid foods has been determined by sensory testing and experimental analysis. AS

Cucumber

- 1553 McFeeters (RF) and Fleming (HP). Effect of calcium ions on the thermodynamics of cucumber tissue softening. *Journal of Food Science* 55(2); 1990; 446-449

Calcium ion was found to cause inhibition of softening in blanched cucumber tissue under acidic conditions due to a dominant effect of the Ca upon the entropy of activation for the softening reaction. This resulted in slower rates of softening despite a decline in the enthalpy of activation. Enthalpy/entropy compensation was found to occur. The

isokinetic temp. for softening was 260 plus or minus 9 K. An assumption was made that the hyperbolic inhibition of softening by Ca was due to saturation of a binding site by Ca. The dissociation constant for Ca from the proposed site was determined to be 1.5 mM at 30 C. This was considerably stronger binding than should occur if Ca was binding to pectin carboxyl groups under similar conditions. The apparent enthalpy and entropy for Ca binding were determined. AS

Leafy vegetables

- 1554 Kalra (CL), Beerh (OP), Berry (SK), Kulkarni (SG), Kour (S), Sehgal (RC), Sharma (BR) and Arora (SK). Evaluation of different varieties of mustard green (*Brassica* spp) for canning of ready-to-serve 'Saag'. *Indian Food Packer* 44(2); 1990; 5-10

Saag (a curried leafy vegetable preparation) prepared from different blends of raya sarson (*Brassica campestris*), chinni sarson (*Brassica chinensis*) and gobbi sarson (*Brassica campestris*) with spinach (*Spinacia oleraceae*) was canned and evaluated for physical and chem. characteristics and organoleptic quality. Raya sarson contained max. protein (39.1%) followed by gobbi sarson (36.3%) and spinach (21.0%). Fat and mineral matter contents were highest in spinach but it was low in Ca content. Crude fibre content was higher in raya sarson followed by gobbi sarson, spinach and chinni sarson. Saag prepared from different blends contained 11.0 to 17.5% protein and 33.0, to 34.9% fat. Taste panel liked most Saag prepared from gobbi sarson alone and that from gobbi sarson:spinach (80:20). The quality of the canned saag did not change during the storage period of 6 months. VKR

Amaranthus

- 1555 Bressani (R), Elias (LG) and Garcia-Soto (A). Limiting amino acids in raw and processed amaranth grain protein from biological tests. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(3); 1989; 223-234

Amino acid supplementation studies with young rats were carried out using raw and processed amaranth grain (*A. cruentus*) of dark- and cream- or light-coloured seeds. The results of various studies repeatedly indicated that threonine is the most limiting amino acid in raw and processed, dark- and cream- coloured grain. Protein quality as measured either as net protein utilization or protein efficiency ratio was improved by threonine addition alone or with other amino acids and decreased liver fat to values similar to those measured with casein. This finding contradicts the reports that state that leucine, determined by chem. score, is the most limiting

amino acid. Leucine addition alone or with other amino acids did not improve protein quality. This study confirmed cream-coloured grain to be nutritionally superior to dark grain and that properly processed grain, light- or dark-coloured, has higher protein quality than raw grain. AS

- 1556 Paredes-Lopez (O), Schevenin (ML), Hernandez-Lopez (D) and Carabez-Trejo (A). Amaranth starch. Isolation and partial characterization. *Starch/Starke* 41(6); 1989; 205-207

Starch was isolated from a new amaranth var. (*Amaranthus hypochondriacus* Mercado type) with outstanding agronomic traits. Some of its physicochemical and functional properties were comparable to maize starch sample. After annealing, both starches exhibited little change in gelatinization peak temp. as assessed by differential scanning calorimetry. It is suggested that this behaviour might be due to the high amylopectin content of the amaranth starch and to a previous annealing effect undergone by the commercial sample during the isolation procedure. Amaranth starch granules showed by scanning electron microscopy a polygonal shape. AS

Amaranth flour

- 1557 Barba de la Rosa (AP), Paredes-Lopez (O), Carabez-Trejo (A) and Ordorica-Falomir (C). Enzymatic hydrolysis of amaranth flour differential scanning calorimetry and scanning electron microscopy studies. *Starch/Starke* 41(11); 1989; 424-428

High-protein amaranth flour (HPAF) and carbohydrate rich fraction (CRF) were produced from raw flour in a single-step process using a heat-stable alpha-amylase preparation. Protein content of flour increased from 15 to about 30 or 39% at liquefaction temp. of 70 or 90 °C resp., and 30 min hydrolysis time. CRF exhibited 14-22 DE. Enzymatic action at 70 °C increased endotherm temp. and gelatinization enthalpy of HPAF, in relation to gelatinized flour, as assessed by differential scanning calorimetry (DSC). Hydrolysis at 90 °C did not affect significantly ($P < 0.05$) DSC peak temp. It is suggested that these changes in DSC performance might result from differences in amount and type of low mol. wt. carbohydrates and residual starch. Scanning electron microscopy (SEM) demonstrated that hydrolysis temp. changed substantially the structural appearance of flour particles. HPAF and CRF might find applications as dry milk extender and sweetener, resp. AS

Rutabaga

- 1558 Anderson (JL), Lisk (DJ) and Stoewsand (GS). Glucosinolates in rutabaga grown in soil capped over coal fly ash. *Journal of*

Food Science 55(2); 1990; 556-557

Nine glucosinolates were measured by HPLC analysis in rutabaga grown on soil capped over a coal fly ash landfill or on normal clay and silt loam soil. Progoitrin (2-hydroxybut-3-enyl glucosinolate) and neoglucobrassicin (1-methoxy-3-indolylmethyl glucosinolate) were the most abundant glucosinolates found. Progoitrin and three other minor glucosinolates were present in the natural soil-grown rutabaga in greater amounts than in that grown in fly-ash soil. However, fly-ash grown rutabaga contained comparatively greater levels of glucobrassicin (3-indolylmethyl glucosinolate) and neoglucobrassicin, the major glucosinolate present. AS

Tomatoes

- 1559 Alviar (MSB) and Ried (DS). Determination of rheological behaviour of tomato concentrates using back extrusion. **Journal of Food Science** 55(2); 1990; 554-555

The back extrusion testing technique can be a very useful tool in assessing the rheological behaviour of non-Newtonian fluids (e.g. tomato conc.). In this procedure, an Instron Model 1122 Universal Testing Machine (with stainless steel, solid rod attachment) was used to measure the forces developed as diluted tomato paste was back extruded in a simple piston/annular cylinder geometry. Assuming power law behaviour, the force-distance data for extrusion at different piston velocities were analyzed to yield the dimensionless flow behaviour index (n) and the consistency coeff. (k) for each sample. Back extrusion measurements were performed on hot break and cold break tomato conc. with different % total solids. For comparison, rheological measurements were also done on a set of samples with a Carri-Med Controlled Stress Rheometer. AS

- 1560 Efiuvwevwere (BJO). Individual sugars and total soluble solids content of ripe tomatoes grown in Northern and Southern Nigeria. **Tropical Science** 29(4); 1989; 255-260

This work was carried out to find out the individual sugar concn. and total soluble solids contents of ripe tomatoes grown in different regions of Nigeria for the purpose of better utilisation of the respective var. for various product manufacture. The analysis of various sugars was carried out by HPLC and TSS was done by Abbe refractometer and the results were statistically analyzed. The results showed that glucose and fructose are the two most abundant sugars present in tomato fruit, with sucrose occurring in small amounts and different amounts of sugars are present in the different

tomato fruit cvs. The fructose concn. was highest in all the cvs viz 'Bendel', 'Gombe' and 'Gabon', but 'Gabon' tomatoes showed the highest concn. of both the individual and total sugars. 'Bendel' tomatoes were higher in fructose than 'Gombe' but there was no difference in their glucose concn. whereas the sucrose concn. was higher in the latter. Total sugar was higher in 'Bendel' tomatoes than in 'Gombe', total soluble solids remaining same both being higher than 'Gombe'. These results are useful in blending different tomato varieties to obtain tomato products of better quality. AS

- 1561 Floros (JD) and Chinnan (MS). Diffusion phenomena during chemical (NaOH) peeling of tomatoes. *Journal of Food Science* 55(2); 1990; 552-553

The apparent diffusivity of NaOH (D) through the skin of processing tomatoes was estimated for various concn. and temp. as it relates to chem. peeling. For concn. of 2 M NaOH or greater, D was independent of concn., which allows the Fick's law of diffusion to be used for simulation of the events during chem. peeling. The temp. dependence of D was of the Arrhenius type (for temp. > 50 °C) with an estimated activation energy $E_a = 71.2 \text{ kJ/mol}$. AS

- 1562 Jimenez (L), Ferrer (JL) and Chica (A). Comparison of rheological, chemical and sensory properties of pulped tomatoes preserved by various techniques. *Acta Alimentaria* 18(2); 1989; 167-176

The rheological, chem. and sensory characteristics of pulped tomatoes preserved by freezing, freeze-drying and pasteurization are compared. The values of the yield stress and the consistency index of the products are in this order: fresh, pasteurized, frozen and freeze-dried. The values of the flow behaviour index, in the forward and return runs, have been determined for all the products. In order to quantify the time-dependence, the Weltman and two proposed equations are used. While some parameters of these equations vary following the previous sequence, others, which reflect the structural rupture rate, vary following this sequence: fresh, freeze-dried, pasteurized, and frozen. The sugar, pectin, soluble solid and insoluble solid contents of pH do not vary from one product to another. However, the vitamin C content is 40% lower for the pasteurized product. Through the use of sensory tests which compare the colour, odour, flavour and texture of the products, it can be deduced that the best process is freezing and the worst is freeze-drying. AS

Tomato paste

- 1563 Buttery (RG), Teranishi (R), Ling (LC) and Turnbaugh (J) (G).

Quantitative and sensory studies on tomato paste volatiles. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 336-340

The concn. of 44 of the major aroma components of tomato paste were determined. Comparison with studies for fresh tomatoes showed marked decrease in concn. for some compounds, particularly aliphatic aldehydes ((2)-3-hexenal and hexanal > 400 times lower) in the paste. Other compounds, however, such as the potent odorant-beta-damascenone (also 6-methyl-5-hepten-2-one, other ketones, linalool, and alpha-terpeneol) show severalfold increases in concn. in the paste. The observation by other workers of the formation of relatively large (0.5-10 p.p.m.) concn. of dimethyl sulphide in processed tomato was confirmed. Considerations of the odour thresholds of components and their determined concn. indicated that the compounds most important to tomato paste aroma include dimethyl sulphide, beta-damascenone, beta-ionone, 3-methylbutanal, 1-nitro-2-phenylethane, eugenol, methional, 3-methylbutyric acid, 6-methyl-5-hepten-2-one, phenylacetaldehyde, and linalool. AS

FRUITS

- 1564 Hanika (G), Seifert (K) and Dorn (U). A simple and rapid gas chromatographic determination of dimethoate residues in fruit and vegetables. *Die Nahrung* 33(10); 1989; 1023-1024 (De).

Citrus fruits

- 1565 Gaonkar (S) and Bamzai (R). Debittering of foods. *Beverage and Food World* 16(2); 1989; 12-15

This article covers briefly bitterness in citrus fruits (flavonoids and limonoids), debittering of citrus juices (adsorption technique, enzymatic techniques, debittering of protein hydrolysates. SRA

Grapes

- 1566 Robinson (DS), Bretherick (MR) and Donnelly (JK). The heat stability and isoenzyme composition of peroxidases in Ohane grapes. *International Journal of Food Science and Technology* 24(6); 1989; 613-618

Soluble and ionically bound peroxidases have been obtained from homogenized Ohane grapes. The soluble fraction contained the highest level of peroxidase activity and accounted for approx. 87% of the total enzymic acidity. Plots of the

percentage of heat inactivation for the grape peroxidase against time were non-linear with approx. 90% of the peroxidase activity being destroyed after 10 min at 80 C. Following heat inactivation there was no significant regeneration of enzymic activity. Using isoelectric focusing six isoperoxidases with isoelectric points ranging from approx. pI 3.5 to 9.8 were detected. AS

Kiwifruits

- 1567 Macrae (EA), Lallu (N), Searle (AN) and Bowen (JH). Changes in the softening and composition of kiwifruit (*Actinidia deliciosa*) affected by maturity at harvest and post-harvest treatments. *Journal of the Science of Food and Agriculture* 49(4); 1989; 413-430

1562 Kiwifruit *Actinidia deliciosa* (A Chev) Liang et Ferguson cv Hayward) were harvested at a range of maturities, from 4.4-8.9% w/v soluble solids, and ripened, with or without ethylene, after harvest or after storage for up to 12 wks at 0 or 4 C. During maturation, the internal ethylene concn. of the fruit increased, and the lag before the onset of rapid softening decreased. Fruit harvest late in the season and ripened at 20 C softened as rapidly as similar fruit treated with ethylene. This occurred both immediately after harvest and after 6 wks in storage at 0 C. In more mature fruit, and fruit stored at 0 C, the difference between core and flesh firmness was greater than in immature fruit or that ripened at 20 C immediately after harvest. After 6 wks in storage, softening of the flesh was almost complete and core firmness had the greatest influence on fruit firmness. Soluble solids concn. increased as fruit softened, but during the first phase of softening soluble solids concn. was high if the fruit were at low temp. (or at 20 C without ethylene treatment) than if they were ethylene treated and held at 20 C. Sucrose increased and starch decreased during softening regardless of treatment. Citrate decreased during softening at 20 C and 12 wks in storage at 0 C. Fructose/glucose ratios were lower in ethylene-treated fruit than in untreated fruit. Malate did not change much on ripening after harvest but increased in response to low temp., especially during storage at 4 C. These differences were also found in the eating-ripe fruit. AS

Mangoes

- 1568 Johnson (GI), Muirhead (IF) and Rappel (LM). Mangoes post-harvest disease control. A review of research in Australia, Malaysia and Thailand. *ASEAN Food Journal* 4(4); 1989; 139-141

This review covers pathogens, disease control

investigations, safety margins for heated dips, disease control during controlled atm. storage (L. A storage), irradiation for disease control, pathogen and fruit physiology and future research. 7 references. SRA

- 1569 Sangchote (S). Effect of postharvest treatments on anthracnose (*Colletotrichum gloeosporioides* penz) and stem end rot (*Dothiorella dominicana* pet. et. cif). of mangoes stored in air or modified atmosphere. *ASEAN Food Journal* 4(4); 1989; 142-144

Mangoes were treated to control natural infection of anthracnose as follows: prochloraz dip, 250 p.p.m. for 30 seconds; hot water at 55 C for 5 minutes; hot benomyl, 500 p.p.m. at 55 C for 5 min.; hot water, 55 C for 5 min. followed by immersion in prochloraz, 250 p.p.m. for 30 seconds; hot benomyl, 500 p.p.m. at 55 C for 5 min. followed by immersion in prochloraz, 250 p.p.m. for 30 seconds. Fruit were stored at 13 C in air or in atm. comprising 2% carbon dioxide and different concn. of oxygen (4% oxygen, 6% oxygen and 8% oxygen) for one month. The most effective disease control treatment was achieved with prochloraz dip at 250 p.p.m. for 30 seconds and storage in 6% oxygen. Mangoes inoculated with the stem end rot organism (*Dothiorella dominicana* Pet. et. Cif), were treated with water at 51, 53, 55, or 57 C for 3, 5 or 7 minutes. The most effective control of stem end rot was achieved with water dip at 55 C for 5 minutes. AS

Mangosteens

- 1570 Tongdee (SC) and Suwangul (A). Postharvest mechanical damage in Mangosteens. *ASEAN Food Journal* 4(4); 1989; 151-155

Mechanical damage is one of the limiting factors in mangosteen marketing. Mangosteen fruit were subjected to tests for fruit detachment force, max. fruit rupture force, and a series of compression forces. Impact damage was assessed by a fruit drop test from various heights singly or packed in columns of 2, 3 or 5 fruit. The fruit detachment force, latex stain at the breakpoint, and the resistance of fruit to compression force reduced as the fruit maturity advanced. Rupture force decreased from over 100 kg for fruit at stage 0 maturity, to about 8 kg for stage 4 fruit. A compression force of 3 to 4 kg caused very slight or no damage to the fruit. At 5 kg or more, the pericarp collapsed in the more mature fruit. Impact damage to the fruit, expressed as a hardening of the pericarp at the point of impact, increased with increasing drop heights. A drop of 10 cm caused slight damage to the pericarp. At 20 cm or higher, damage to the pericarp increased and the aril was also affected. For fruit

dropped while packed in columns 2, 3 or 5 fruit high, more damage occurred to the lowest fruit. Mechanical damage in mangosteens would be reduced greatly by careful handling thus avoiding forces sufficient to cause compression or impact damage. AS

Oranges

- 1571 Chamarro (J) and Molina (I). Oxidation of indoleacetic acid by an apparently homogeneous peroxidase from the flavedo of Washington novel oranges (*Citrus sinensis*). *Journal of Food Biochemistry* 13(5); 1989; 361-375

Orange flavedo peroxidase was purified by ammonium sulphate fractionation, gel filtration and ion-exchange chromatography. The anionic fraction, representing 51% of the total peroxidase activity, was an apparently homogeneous isoenzyme with an PI of 4.0. The cationic fraction was composed of two isoenzymes of pI of 10.0 and 11.5. The anionic peroxidase indoleacetic acid in the presence of hydrogen peroxide and 2,4-dichlorophenol. This reaction was inhibited by Mn^{2+} and enzyme activity decreased at increasing pH in the range of 4.0 to 5.5. This isoenzyme also oxidized indoleacetic acid in the reaction mediated by 2,4-dichlorophenol, Mn and phosphate. In this case the optimum pH was 4.5 and the reaction was inhibited by hydrogen peroxide. Study of the characteristics of both reactions indicates that, even though they could share some common steps and have similar end products, they probably differ in their reaction mechanism. The possible physiological significance of the hydrogen peroxide mediated oxidation of indoleacetic acid is briefly discussed. AS

Pears

- 1572 Farag (S), Daood (H) and Kovacs (E). Biochemical changes in stored pears after radiation, calcium chloride kinetin treatments. I. Lipxygenase activity in relation to the breakdown disorder. *Acta Alimentaria* 18(2); 1989; 143-151

Lipxygenase (LOX) activity in pear fruits (var. Hardenpont) stored at 17 C and 80-85% R.H. was determined after different treatments (irradiation with 1 and 2 kGy; CaCl and kinetin). Activity levels were different in peel, flesh and core of the fruit and increased by the end of the storage period (90 days). Healthy parts of the fruits showed higher enzyme activity than those with internal breakdown. At the beginning of storage, enzyme activity was lower in irradiated fruits than in those without irradiation, whereas no considerable effect of the other treatments on LOX activity was observed. By the end of storage, CaCl treatment caused

strong activation of the LOX enzyme while the lowest activity level was noticed after kinetin treatment. The decay (%) of the fruits reached a high level, in agreement with the increase in LOX activity. CaCl treatment promoted both LOX activity and decay (%) whereas irradiation caused substantial reduction in both. In spite of its remarkable inhibiting effect on LOX activity, kinetin treatment had no influence on decay (%) as compared to the untreated control. AS

- 1573 Nwugo (MI), Emebiri (LC) and Nwaiwu (MY). Post-harvest rot diseases of fruits of the African pear (*Dacryodis edulis*) in South Eastern Nigeria. *Tropical Science* 29(4); 1989; 247-254

In this paper the results of studies on the rots of the African pear (*Dacryodis edulis*) crop in South Eastern Nigeria and the effects of the pathogens on the total nitrogen, starch and lipid are also presented. The postharvest soft rot diseases of African pear fruits have been found to be due to *Botryodiplodia theobromae*, *Aspergillus niger*, *Rhizopus stolonifer* and *Erwinia* spp. *B. theobromae* and *R. stolonifer* seem to account for about 80% of the total loss, while *A. niger* and *Erwinia* spp. account for the balance. The results showed that all the pathogens grew in culture at temp. or above 10 C and no growth was recorded at 5 C, and 40 C and no rot developed on inoculated fruits incubated at 5, 10, and 15 C but there was progressive decay with increase in temp. from 20 to 30 C. The infection by *B. theobromae* resulted a loss of 61% of starch and 2% total N and increase in lipid by 19.6% whereas infection by *A. niger* resulted loss of 71% in starch and 46% loss in total lipids and increase in total N by 89.6% . NGKR

CONFECTIONERY, STARCH AND SUGAR

Confectionery

Cocoa

- 1574 Jinap (S) and Dimick (PS). Acidic characteristics of fermented and dried cocoa beans from different countries of origin. *Journal of Food Science* 55(2); 1990; 547-550

Thirty-nine fermented and dried cocoa bean samples from 13 countries were evaluated for pH, titratable acidity and concn. of volatile and nonvolatile acids. The correlation coeff. between pH and $\log_{10}$ titratable acidity was -0.94. Cocoa beans from Brazil and Far Eastern countries were highly acidic while those from Central American and South American countries were low in acidity. Samples from West African countries were

intermediate with titratable acidity values from 0.12 to 0.15 meq NaOH/g sample and pH values from 5.20 to 5.49. Highly acidic beans were characterized by high concn. of acetic and lactic acids. The high correlation between acetic acid and both pH ($r = 0.86$) and titratable acidity ($r = 0.91$) indicated that this acid could be primarily responsible for high acidity in cocoa beans. AS

Starch

- 1575 Chinachoti (P), Steinberg (MP) and Villota (R). A model for quantitating energy and degree of starch gelatinization based on water, sugar and salt contents. *Journal of Food Science* 55(2); 1990; 543-546

A mathematical model defining the relation, of moisture, sucrose and salt on the degree of starch gelatinization obtained from DSC, was developed. As moisture increased to 1.0 g water, gelatinization rose to 85% and was complete at 1.5 g water. Addition of 5% to 15% sucrose had no effect between 0.5 and about 0.8 g water, but a higher moisture degree of gelatinization decreased with increasing sucrose. Salt showed a similar effect. The model covered 30% to 80% water, 0% to 15% sucrose, and 0% to 7.5% salt ($R^2 = 0.94$). A test application of the model extended to rice and wheat starch, showed some correlation, but not conclusively. AS

- 1576 Inglett (GE). Amylo-oligosaccharide formation from *Bacillus stearothermophilus* alpha-amylase action on starches. *Journal of Food Science* 55(2); 1990; 560-561

The action of alpha-amylase from *Bacillus stearothermophilus* on starches is distinguished by early dominant quantities of maltohexaose (DP_6), followed by its erosion and increases in amylo-oligosaccharides with various degrees of polymerization (DP): maltose (DP_2), maltotriose (DP_3) and maltopentose (DP_5). Amylolysis of the starches at high substrate concn. (20-30%) and elevated temp. (95 °C) gave yields of 11-31% maltohexaose in the hydrolysate comp. The alpha-amyinolysis of jet-cooked ordinary, waxy and high-amylose corn starches is greater with the high-amylose starch than with the starches containing increasing quantities of amylopectin. Starch derivatives with hydroxypropyl groups greatly reduced amyinolysis, but these groups did not alter the action patterns. AS

Sugar

- 1577 Gaonkar (SM) and Kulkarni (PR). Utilization of sugarcane residues in foods. *International Journal of Food Science and Technology* 24(6); 1989; 669-672

Foods with upto 15% fibre from sugarcane residue (bagasse) replacing rice flour in *chakalis*, and corn flour in custard and 20% of the wheat flour in non-khatai; the overall acceptability was good but at higher levels the product was not acceptable. No after-taste or fibres were detected sensorily in any product and, not unexpectedly on addition of an insoluble product, mouth feel was the first limiting attribute in custard and non-khatai. Ash increased slightly and crude fibre, neutral detergent fibre and acid detergent fibre content increased markedly. Energy decreased slightly with added fibre content. Addition of fibre upto 20% did not alter the handling characteristics of *chakali* dough and extrusion with bagasse fibre offers both utilization of a waste product and some nutritional benefits. BV

BAKERY PRODUCTS

Bread

- 1578 Avital (Y), Mannheim (CH) and Miltz (J). Effect of carbon dioxide atmosphere on staling and water relations in bread. *Journal of Food Science* 55(2); 1990; 413-416

The effect of modified atmosphere packaging (MAP) on staling and on water relations in bread was evaluated. Application of carbon dioxide in MAP delayed staling of bread. Water sorption of bread packed in carbon dioxide was reduced compared to fresh bread and to bread packed in air. A water activity of 0.75 was found to be the boundary between the multilayer and the free water range of the isotherm. Spoilage of bread (microbial growth and staling) took place only above this water activity. Inverse gas chromatography was found to be unsuitable for investigating the effect of carbon dioxide on bread at the higher water activities because equilibrium conditions could not be achieved at these water activities. AS

- 1579 Lundh (G) and Macritchie (F). Size exclusion HPLC characterization of gluten protein fractions potential varying in breadmaking. *Journal of Cereal Science* 10(3); 1989; 247-253

Size exclusion-high performance liquid chromatography (SE-HPLC) was used to characterise 10 gluten protein fractions from each of two wheat var. differing in dough strength and baking potential. The proportion of glutenin in each fraction was estimated by summing the portion of each fraction that was insoluble in SDS solution and the soluble portion of mol. wt. greater than 80000 deduced from the chromatograms. With increasing fraction number, the proportion of glutenin rose

and this paralleled the effects of the fractions in increasing dough development time and loaf vol. In accord with this result, the parent gluten from the var. with stronger dough properties and better baking performance contained a greater proportion of glutenin than its poorer counterpart, despite having a similar high mol. wt. glutenin subunit comp. AS

- 1580 Rasco (BA), Rubenthaler (G), Borhan (M) and Dong (FM). Baking properties of bread and cookies incorporating distillers' or brewer's grain from wheat or barley. *Journal of Food Science* 55(2); 1990; 424-429

The effect of granulation, level of soluble solids, and drying method on the mixing properties and baking performance of distillers' grain products from wheat in yeast-raised breads and cookies were evaluated and compared with products containing barley spent grains (BSG). Grinding had a variable effect on baking properties. Breads containing 8% wheat distillers' grains (WDG)(no solubles) had the lowest loaf vol. Breads made with WDG and BSG had the poorest crumb grain. There were few differences observed in the mixing and baking properties of wheat distiller's grains (DDGS or DDG) regardless of whether the materials were dried by harsh (steam tube, tunnel) or milder (atmospheric drum) drying treatments. AS

Cookies

- 1581 Nishibori (S) and Kawakishi (S). Effects of dough materials on flavour formation in baked cookies. *Journal of Food Science* 55(2); 1990; 409- 412

The effects of dough materials on flavour formation in baked cookies were investigated in detail. The baked cookies were prepared from wheat flour, eggs, butter, sugar and sodium bicarbonate and heated at 150 C for 10 min. This dough was extracted with methanol/water (3:1,v/v) and the extracts were submitted to HPLC. The two main peaks, among 10 peaks detected, were identified as 2,3-dihydro-3,5-dihydroxy-6-methyl-4H-pyran-4-one (DDMP) and 5-hydroxymethyl-furfural (HMF), resp. DDMP seemed to be a key substance enhancing the good qualities of cookies with its favourable aroma. The generation of DDMP in baking was affected by the addition of proteins and amino acids, and among these, ovalbumin, proline, arginine and histidine strongly enhanced the DDMP generation. AS

Wafers

- 1582 Dzugasova (J), Dodok (L), Varga (S) and Gajdosikova (M). Flow properties of wafer batters. *Die Nahrung* 33(10); 1989; 957-964

(De).

The flow properties of wafer batters and the influence of temp. and the solid content were investigated. The results showed that the water batters are non-Newtonian, time-dependent and thixotropic fluids. Viscosity curves were mathematically described by the expression: $\eta = \frac{K}{\dot{\gamma}^n}$ (K consistency index; n flow behaviour index). Effect of temp. and solid content on rheological properties is considerable. AS

MILK AND DAIRY PRODUCTS

- 1583 Halpin-Dohnalek (MI) and Marth (EH). Growth and production of enterotoxin A by *Staphylococcus aureus* in cream. *Journal of Dairy Science* 72(9); 1989; 2266-2275

Behaviour of *Staphylococcus aureus* strains 100-A, 196-E, 254, 473, 505 and 521 in sweet cream containing 18 to 80% milk fat and neutralized sweet cream was studied for its growth and enterotoxin production. Inoculum count was adjusted to give a count of 10^3 or 10^4 in the cream. Inoculation was done at 4, 22 and 37 C. Aerobic plate count, *S. aureus* and pH were determined. Sweet cream with various amounts of milk fat (18-40%) and held at 37 C supported good growth of *S. aureus*. High fat content, acid production and low temp. 4 C did not support the growth of *S. aureus* and toxin production. JSS

- 1584 Hashisaka (AE), Einstein (MA), Rasco (BA), Hungate (FP) and Dong (FM). Sensory analysis of dairy products irradiated with cobalt-60 at -78 C. *Journal of Food Science* 55(2); 1990; 404-408, 412

Sensory evaluations by healthy individuals were conducted on cobalt-60 irradiated retail dairy products which were to be incorporated into the low microbial diets of immunosuppressed patients. Irradiation (40 kGy at -78 C) caused little change in product colour or texture, but generally there was a decrease in overall acceptability and an increase in off-flavour and aftertaste. Modified atm. packaging (nitrogen, helium, or air) or antioxidant addition (ascorbyl palmitate or a combination of butylated hydroxyanisole and butylated hydroxytoluene) prior to irradiation were effective in preserving specific sensory attributes, which in some cases resulted in improved overall acceptability (helium packed peppermint ice cream; ascorbyl palmitate treated strawberry yoghurt bars) when compared to untreated irradiated products. AS

- 1585 Nguyen (MH), Lefebvre (MS) and Johnson (RA). Counter diffusion for liquid food demineralisation. *ASEAN Food Journal* 4(4); 1989; 164-166

This paper compares counter diffusion with other technologies and reports on the recently established industrial plant for dairy liquids and molasses. Application of this technology to the desalting of other liquid foods are also outlined. SRA

- 1586 Ollilainen (V), Heinonen (M), Linkola (E), Varo (P) and Koiviston (P). Carotenoids and retinoids in Finnish foods. Dairy products and eggs. *Journal of Dairy Science* 72(9); 1989; 2257-2265

Carotenoid and retinoid content in twenty dairy products and eggs were determined. High values for both carotene and retinol were found in high fat cheeses and cream from 179.0 to 3187 $\mu\text{g}/100\text{g}$, from 86.7 to 186.5 $\mu\text{g}/100\text{g}$ for all trans retinol and total beta-carotene resp. The major pigment in egg and egg yolk was lutein 619.5 $\mu\text{g}/100\text{g}$ in eggs and 1575.8 $\mu\text{g}/100\text{g}$ in egg yolk. In Finland major source of vitamin A is dairy products and eggs which give an av. daily intake of 350 retinol equivalents. JSS

Milk

- 1587 Baer (RJ), Tieszen (KM), Shingoethe (DJ), Casper (DP), Eisenbeisz (WA), Shaven (RD) and Cleale (RM). Composition and flavour of milk produced by cows injected with recombinant bovine somatotropin. *Journal of Dairy Science* 72(6); 1989; 1424-1434

Milk from 10 Holstein cows injected with 30.9 mg/head per d recombinant bovine somatotropin and 11 control cows was analyzed for composition and flavour. Experimental treatments started wk 15 postpartum and continued to the end of lactation. Milk samples were analyzed at wk 14 postpartum (pretreatment for covariant adjustment) and wk 2, 4, 6, 8, 12, 16, 20, 24, and 28 of the treatment period. Adjusted means for total protein (3.48, 3.49%), true protein (3.28, 3.28%), casein (2.63, 2.58%), NPN (.03, .03), fat (3.47, 3.52%), freezing point (-.547, -.545 H), titratable acidity (.16, .16%), pH (6.60, 6.64), initial acid degree value (.58, .59), and acid degree value of milk with induced hydrolytic rancidity (3.41, 3.56) were similar for control and somatotropin milk, resp., whereas serum protein (.65, .71%) and lactose (4.71, 4.80%) were higher and casein as a percent of true protein (80.2, 78.8%) was lower with the somatotropin treatment. Proportions of short-chain (11.6, 10.5%) and medium-chain (58.5, 56.0%) fatty acids were reduced and long-

chain fatty acids (26.9, 30.4%) increased for control and somatotropin milks, resp. Individual and composited milk samples from control and somatotropin cows exhibited no off-flavour, and no differences between milks were observed. Milk from cows treated with somatotropin was no more susceptible to rancid or oxidized off-flavours than control milk. AS

- 1588 Barnes (MA), Peassen (RE), Lee (KL) and Lukes (AJ). Factors contributing to variation reported milk component percentage in Holstein and Jersey milk. *Journal of Dairy Science* 72(6); 1989; 1596-1604

Automated milk testing was compared with Bobeock and Majennier method. Two herds of Holstein and Jersey breeds were used. Milk comp. variation on daily basis was monitored. Protein, fat and lactose were analysed. The data indicated that variation in herd milk component test results from variation in detn. as well as from biological variation in milk component content of cattle. JSS

- 1589 Connolly (J), Fleming (MG) and Reid (P). Routine testing of producers' milk supplies for compositional quality using randomly selected samples. *Journal of the Society of Dairy Technology* 42(2); 1989; 42-47

In a study over a number of months, involving over 500 milk producers in three locations, and representing bulk milk collection from cans as well as mobile and stationary refrigerated bulk milk tanks, the precision of various random sampling and testing frequencies in estimating the fat, protein and lactose content of milk was evaluated. In addition, the traditional procedure of estimating the composition of milk supplies from chemically preserved composites was compared to values obtained by analysis of fresh samples. While sampling and testing every milk collection gave the most precise estimate of milk composition for each producer, it was found that for producers using refrigerated bulk milk tanks with ex-farm collection, four random samples per month gave a precision of plus or minus 4% (or plus or minus 0.14% fat approx.) for monthly fat content and plus or minus 1.2% (or plus or minus 0.04% fat approx.) for annual fat content. Due to lower variability the precision for both protein and lactose estimation was much higher. The samples compositing procedure, while capable of a relatively high level of precision, did not always achieve this in practice and tended to underestimate the constituents in milk, especially protein and lactose. AS

- 1590 Dodeja (AK), Sarma (SC) and Abichandani (H). Heat transfer during evaporation of milk to high solids in thin film scraped surface heat exchanger. *Journal of Food Process Engineering*

12(3); 1990; 211-225

Thermal performance of thin film scraped surface heat exchanger was evaluated for concn. of milk to high solids with process variables such as mass flow rate, steam condensing, temp. etc. Appropriate dimensionless groups were formulated and fitted in Cobb-Douglas model to obtain a correlation. This relationship which is in the form of a Nusselt equation will be useful in predicting the scraped film coeff. during milk concn. to high solids. The effect of process variables on scraped film coeff. were discussed. AS

- 1591 Mattila (T), Manninen (M) and Kylasiurola (AL). Effect of cleaning-in-place disinfectants on wild bacterial strains isolated from a milking line. *Journal of Dairy Research* 57(1); 1990; 33-39

Two cleaning-in-place disinfectant systems (alkaline-acid, alkaline-Cl) were tested on wild bacteria isolated from a milking line. Most of the isolated strains were Gram-negative and capsule-positive. The effect of milk and cream on the resistance of the wild strains to the cleaning systems was tested. Suspension tests did not show the resistance of bacteria whereas the surface test showed high resistance towards all cleaning agents. Milk had a protective effect only on the surface whereas cream showed mild protection in suspension and complete protection on the surfaces. It was concluded that the growth pattern of contaminants on surfaces needs further attention and the lab. suspension tests do not correlate with the practical situation. Disinfectant tests based on bacterial growth on the surface are of importance. AS

- 1592 McDougall (IA). Biotechnological modification of milk fat, with particular attention to enzymic approaches. *Journal of the Society of Dairy Technology* 42(2); 1989; 40-41

- 1593 Min (DB), Ticknor (DB), Lee (SH) and Reineccius (GA). Effects of processing conditions and antioxidants on the oxidative stability and carbon dioxide formation in low-fat dry milk. *Journal of Food Science* 55(2); 1990; 401-403, 423

The effects of different processing methods and antioxidants on the oxidative stability and carbon dioxide formation in low-fat dry milk at 65 C for 8 days were determined by measuring volatile compound formation, oxygen disappearance, and carbon dioxide formation in the gas-tight sample bottle by gas chromatography. Foam spray dried or steam jacketed centrifugal wheel atomization dried milks had significantly less ($P < 0.05$) volatile compound formation, oxygen depletion, and carbon dioxide formation than

conventional spray dried milks. Dry milks containing 100 p.p.m. propyl gallate showed significantly less ($P < 0.05$) oxygen disappearance, volatile compound formation, and carbon dioxide formation than dry milk containing 100 p.p.m. butylated hydroxyanisole or tertiarybutyl hydroquinone during storage. AS

- 1594 Moxcy (RB) and Liewen (MB). Function of preliminary incubation of raw milk samples for quality control. *Journal of Dairy Science* 72(6); 1989; 1443-1445

Preliminary incubation of raw milk samples to evaluate bacterial quality has been a commonly recommended practice. The presumption has been that selective growth of a segment of the microflora associated with unsanitary methods and conditions would be enhanced. The present work involved a theoretical approach to evaluate this presumption. Pure cultures of *Pseudomonas aeruginosa*, *P. fluorescens*, and *Escherichia coli* as well as enriched mixed cultures of psychrotrophs and mesophiles were used. The generation time of each culture was determined at various temp. An analysis of covariance showed the coeff. of generation time related to temp. were not significantly different. Thus, preliminary incubation in the range of the temp. now recommended does not have a selective effect for specific groups of microorganisms. AS

- 1595 Singh (CP), Saxena (GC) and Roy (NK). Influence of pH on the heat stability of cow milk and its concentrates. *Beverage and Food World* 16(2); 1989; 25-27

The av. pH (at 30 C) of cow's whole milk (6.76) decreased to 6.68 by concentrating the milk for 1.5 times, and further to 6.58 for 2.0 times concentrated milk. HCT of 1.5 time concentrated cow's milk considerably decreased when its pH increased from 6.65 to 6.70. But it increased with further increase of pH to 6.75, however, the HCT at 6.75 was slightly lower than that at 6.65. On the contrary, HCT of 2.0 times concentrated cow's milk, increased progressively with increase in pH from 6.50 to 6.65 and 6.60. Thus it is observed that for 2.0 times concentrated milk system from cow's milk HCT is greater at highest pH of the system. SRA

- 1596 Yildiz (F) and Westhoff (DC). Sporulation and thermal resistance of *Bacillus stearothermophilus* spores in milk. *Food Microbiology* 6(4); 1989; 245-250

Sporulation of *B. stearothermophilus* was followed by recording bright cells in phase contrast microscopy and vegetative growth by absorbance at 600nm using trypticase soy broth supplemented with four minerals at 3 different levels.

Highest degree of sporulation (75%) was observed when level of CaCl₂, ferrous sulphate, manganese sulphate and magnesium chloride was 25, 31, 30 and 11 p.p.m. resp. Thermal resistance (D_{250F}) of the spores was higher in (M NaCl (7.8 min) than either in distilled water (2.9 min) or in sterile milk (3.5 min). In sterilised milk, D_{240F} (115.5 °C) and D_{260F} (126.6 °C) was 22.4 and 0.37 min resp. NK

Skim milk

- 1597 Navder (KP), Syu Huang (R-F), Beth Fryer (E) and Fryer (HC). Effects of fermentation and storage on the concentration of orotic acid and uric acid in skim milk. *Journal of Food Science* 55(2); 1990; 585-586

Skim milk (SM) and skim milk yoghurt (SMY) were produced and analyzed using HPLC for the presence of two organic acids- orotic acid (OA) and uric acid (UA). The concn. of OA in SM and SMY at 0 days was 106.2 and 46.1 p.p.m., resp. After fermentation OA concn. was 56% lower ($P < 0.05$) in SMY than in nonfermented SM. UA content of SM and SMY at 0 days was 23.3 and 20.1 p.p.m. resp. Unlike OA, the UA contents were not significantly altered after fermentation. No significant differences were detected in the concn. of OA and UA when values of SM and SMY of 0 days were compared with those after 3 days storage. AS

Milk products

Cheese

- 1598 Alkhalaf (M), El Soda (M), Gripon (JC) and Vassal (L). Acceleration of cheese ripening with liposomes entrapped proteinase. Influence of liposomes net charge. *Journal of Dairy Science* 72(9); 1989; 2233-2238

A proteolytic enzyme (Neutrase) used for the acceleration of cheese ripening was entrapped in neutral, positively charged, or negatively charged liposomes prepared by reversed phase evaporation. The liposomes-trapped enzyme was then added to Saint-Paulin cheese milk. Ionic liposomes entrapped more enzyme than neutral liposomes. The percentage of retention of the liposomes in the cheese was highest for positively charged, then negatively charged, then neutral liposomes. Liposomes stability in milk was lower at acidic pH and also decreased with increasing temp. and NaCl concn. Neutral and positive liposomes were more stable than negative liposomes. Low adsorption of Neutrase on liposomes surface was observed. AS

- 1599 Anprung (P), Chuengsaengsatityaporn (S) and Thunpithayakul

(C). Immobilized rennin for cheesemaking 11. Application to cheesemaking. *ASEAN Food Journal* 4(4); 1989; 156-161

In this paper, the use of rennin covalently bonded to sand for milk coagulation and cheese making is proposed. Development of this system provided an opportunity for the study of some parameters related to the enzymic coagulation of milk and the feasibility of using rennin immobilised on sand for cheese making. This is judged by clotting time and curd firmness, i.e. milk, pH 5.9 at 40 °C without Ca., salt addition and with 0.0292 KRU of Rennilase-L per millilitre of milk. Cheese produced using prepared immobilized rennin in a 16 x 12 x 12 inch stir tank contained 43.7% moisture, 20.6% protein and 18.0% fat which is similar to cheese produced from native rennin. After using the same immobilised rennin 10 times in Cheddar-type cheesemaking, the curd setting times become slightly longer after each successive use. Organoleptic tests on the cheese produced using the immobilized rennin show good ratings for colour, odour, taste, texture and total acceptance. SRA

1600 Denis (F) and Ramet (J-P). Antibacterial activity of the lactoperoxidase system on *Listeria monocytogenes* in trypticase soy broth, UHT milk and French soft cheese. *Journal of Food Protection* 52(10); 1989; 706-711

The antibacterial activity of the lactoperoxidase system on the growth and survival of *Listeria monocytogenes* in trypticase soy broth, UHT milk and French soft cheese was determined. Several levels of *Listeria* cells, ranging from ca. 10^4 to 10^7 CFU/ml were studied. A comparison was made between the behaviour of *L. monocytogenes* in these media with or without the lactoperoxidase system at two storage temp., 4 and 15 °C. In trypticase soy broth and UHT milk, presence of the lactoperoxidase system either inhibited growth or completely inactivated inoculated cells. Complete inactivation occurred at different times depending on initial inoculum concn., culture medium, and storage temp. In UHT milk, the D-values were determined from the regression lines of log cell population versus time. The linear correlations are significant, and D-values were the same (ca. 5 d at 15 °C and ca. 8 d at 4 °C) whatever the initial cell level. The efficiency of the lactoperoxidase system is dependent on temp., which directly determines the antibacterial activity. The addition of the lactoperoxidase system to the surface of soft cheese led to elimination of viable *Listeria* cells from cheeses previously inoculated to contain 10^6 CFU/g. The results of this study suggest that the lactoperoxidase system may be effective in dairy products as a safety factor to assist in the inhibition of *L. monocytogenes*. AS

- 1601 Fox (PF). Proteolysis during cheese manufacture and ripening. *Journal of Dairy Science* 72(6); 1989; 1379-1400

Proteolysis and its assessment in cheese has been reviewed. Three phases of proteolysis are premanufacture, coagulation by rennets. Ripening methods, available for assessment of proteolysis are solubility of peptides, liberation of reactive functional groups, chromatography and electrophoresis. JSS

- 1602 Hegazi (FZ). Some properties of *Streptococcus faecalis* subsp. *Liquefaciens* isolated from cheese with special reference to production of bitterness. *Die Nahrung* 33(10); 1989; 889-997

Streptococcus faecalis subsp. *Liquefaciens* was examined for proteolysis and development of bitterness in sterile buffaloes' skim milk with and without some additives. Cell population and the pH of milk were the most important factors in the breakdown of casein and development of bitterness. Sodium chloride level, altering the final concn. of bacteria in milk, had a direct role in the production of bitter peptides. Calcium ions up to 5 mM did not affect proteolysis whereas higher concn. were inhibitory. Electrophoretic analysis of proteose-peptone formed in sterile skim milk with and without NaCl revealed the presence of 3 peptides, 2 of which were probably associated with bitterness. *S. faecalis* subsp. *liquefaciens* produced acidity slowly, but was the most acid producer (1.25% after 72 h) of the streptococci. However, milk coagulated enzymatically and the curd shrinkage was related to salt-dependent acidity. Strains of the organism coagulated fresh citrated human plasma within 21 h at 30 °C, but without any visible fibrinolysis. The strains also were all alpha-haemolytic with occasionally a very few beta-haemolytic variants on sheep blood agar. On human blood agar, a weak alpha-reaction was given. AS

- 1603 Humbert (G), Guingamp (M-F), Kouomegn (R) and Linden (G). Measurement of proteolysis in milk and cheese using trinitrobenzene sulphonic acid and a new dissolving agent. *Journal of Dairy Research* 57(1); 1990; 143-148

Bacterial activities in cheese lead to protein hydrolysis which may have important effects on cheese quality and yield. It is useful to estimate proteolysis and its development during cheese ripening. In this study, the application of trinitrobenzene sulphonic acid (TNBS) and a new dissolving reagent to measure free amino groups in milk and cheese. The dissolving reagent, which is patented, is a mixture of free organic solvents and detergents which has an apparent pH greater than 13.0 and a very weak absorbance from 340 to 800 nm. It can be obtained from prolabo (75011 Paris, France).

The proposed method for measurement of free amino groups with TNBS and samples clarification is easily applied to opalescent products because the preliminary steps of precipitation, centrifugation or filtration are unnecessary. It is possible to determine the amount of amino groups of amino acids, peptides or proteins and to measure or to follow proteolytic activity in milk and dairy products. MCV

- 1604 Kim (MS) and Olson (NF). Citrate inhibition of aminopeptidase in commercial fungal protease preparations used to accelerate cheese ripening. *Journal of Dairy Science* 72(6); 1989; 1418-1423

The potential for inhibiting leucine aminopeptidase activity by citrate was examined using commercial proteases (Rhozyme P-41, Corolase PN, Corolase PS) from *Aspergillus oryzae*. Leucineaminopeptidase activities of the first two enzyme preparations were reduced by 20- to 25-fold in citrate-phosphate buffer, 2.2- to 2.4 fold in Tris-maleate buffer, and 10.4 to 10.6 fold in sodium acetate buffer. All buffers were .01 M and at pH 5.4 and 37 C except the acetate buffer. Corolase PS was more sensitive to buffer type and lost all activity in the citrate phosphate buffer. Leucineaminopeptidase activities were reduced by 96 to 98% in the presence of 0.1 M citrate in Tris-maleate buffer, which approx. the concn. in the moisture phase of cheese if none is metabolized by lactic bacteria. Activity was restored by adding Mg suggesting that chelation of essential divalent cations caused inactivation. However, only 6.8% of activity was restored by 5 mM Mg, equal to the total Mg concn. in milk. The data suggest that cheese ripening could be affected by citrate or other cation chelating agents in cheese. AS

- 1605 Tsal (KP) and Luedecke (LO). Impedance measurement of changes in activity of lactic cheese starter cultures after storage at 4 C. *Journal of Dairy Science* 72(9); 1989; 2239-2241

Impedance, titratable acidity, and change in pH were used to measure activity of lactic cheese starter culture held up to 7 days at 4 C. The impedance microbiology, as quantified by the impedance detection time method, provided an activity estimate within 37 and 53 min, and the results were similar to the activity measurements using titratable acidity (3.5 h) and change in pH (2.5 h). The impedance detection time, titratable acidity and pH activity tests showed that the culture activity decreased most rapidly between 2 and 5 days. The slope of the impedance curve, 15 min after the impedance detection time, decreased as storage time increased with the sharpest decrease occurring during the first 3 days of storage. AS

Cabrales cheese

- 1606 Mayo (B), Hardisson (C) and Brana (AF). Characterisation of wild strains of *Lactococcus lactis* subsp. *lactis* isolated from Cabrales cheese. *Journal of Dairy Research* 57(1); 1990; 125-134

The present work deals with the characterisation of several relevant properties in wild strains of *Lactococcus lactis* subsp. *lactis* isolated from cheese made from raw milk and compared with well known starter strains. Many of them produced acid bacteriocins resembling those of other lactic streptococci and their patterns of antimicrobial agent susceptibility were also similar to previously studied dairy strains. On the basis of their ability to clot milk, two groups were identified, rapid fermenters with high beta-phosphogalactosidase and proteolytic activities and the second with low beta-phosphogalactosidase activity and coagulated milk slowly, but seemed to have proteolytic activity. All the strains had plasmid DNA in amounts and sizes similar to starter strains. Southern hybridization located homologous sequences in chromosomal and plasmid DNA from the wild isolates that fermented lactose efficiently, but the degree of homology was lower than that observed between starter strains. Source of these strains was a cheese made from raw milk to which no starter flora were added, hence, the lactic isolates may be genetically different in terms of lactose metabolism, although they conserve other physiological features that may be common to other lactococci adapted to similar environments. MCV

Cheddar cheese

- 1607 Lee (BH), Laleye (LC), Simard (RE), Holley (RA), Emmons (DB) and Giroux (RN). Influence of homofermentative lactobacilli on physicochemical and sensory properties of Cheddar cheese. *Journal of Food Science* 55(2); 1990; 386-390

Cheddar cheeses were produced under pilot plant conditions using a commercial *Streptococcus* culture amended with one of 10 homofermentative *Lactobacillus* strains. During the ripening period, pH, acidity, salt, moisture, fat, texture, fissure formation, gas development and sensory status were evaluated. *Lactobacillus* treated cheese did not differ much from the control in pH and acidity but acidity increased substantially after draining and cheddaring. *Lactobacillus* numbers increased at all stages as compared with the uninoculated control. High quality Cheddar cheese was produced by *L. casei*-subsp-*casei* (119-10/62) and *L. casei*-subsp-*pseudopiantarum* (137-10/62) from 7 to 12 vats aged for 2 months at 15 C and for a further 10 months at 7 C or 15 C.

Fissure formation was observed in cheese made with *L. casei*-subsp-*rhamnosus* one of the four cultures of *L. casei*-subsp-*rhamnosus* one of the four cultures of (LH13) and two of the three strains of *L. casei*-subsp-*pseudopiantarum* (83-4-12/62 and L3E). Certain *Lactobacillus* strains produced cheese with slight flavour defects. Other strains, in particular *L. casei*-subsp-*rhamnosus*, contributed to high acidity (72 - 0.89 dornic) and low pH (5.2) at salting. AS

- 1608 Lee (BH), Laleye (LC), Simard (RE), Munsch (M-H) and Holley (RA). Influence of homofermentative lactobacilli on the microflora and soluble nitrogen components in Cheddar cheese. *Journal of Food Science* 55(2); 1990; 391-397

Cheddar cheese was manufactured by inoculation with and without cultures of homofermentative lactobacillus strains (*L. casei*-subsp-*casei*, *L. casei*-subsp-*pseudopiantarum*, *L. plantarum*). Growth rate of microflora, the incidence of heterofermentative lactobacilli and the rate of proteolysis were then studied during aging. The total number of psychotrophs, mesophiles and lactic streptococci reached a max. at 5 months but max. numbers attained were dependent upon the curing temp. (7 C or 15 C). The acceleration of cheese ripening by *Lactobacillus* cultures was accompanied by a greater degree of protein hydrolysis which was detectable after 8 months aging as soluble nitrogen in TCA extracts (360 mg/100 g at 15 C and 240 mg at 7 C, versus 170 mg and 75 mg, resp. for the controls). AS

Cottage cheese

- 1609 Earnshaw (RG), Banks (JG), Defrise (D) and Francotte (C). The preservation of cottage cheese by an activated lactoperoxidase system. *Food Microbiology* 6(4); 1989; 285-288

An activated lactoperoxidase system (LP-S) consisting of the addition to chill stored cottage cheese of 1.2×10^4 units kg^{-1} lactoperoxidase (LP) and 84 mg kg^{-1} potassium thiocyanate was activated with a glucose/glucose oxidase system and additionally in a separate exp. with 376 mg/kg urea peroxide. The LP-S was found in all cases to be lethal to *Escherichia coli* and *Salmonella typhimurium* inoculated into the cottage cheese. The LP-S treatment did not affect the pH or sensory characteristics of the cheese. AS

Quarg cheese

- 1610 Shah (N), Jelen (P) and Ujvarosy (S). Rennet effects and partitioning of bacterial cultures during quarg cheese manufacture. *Journal of Food Science* 55(2); 1990; 398-400, 454

Quarg was prepared with or without milk heating or rennet addition using yoghurt, acidophilus, and buttermilk cultures. Total solids and protein contents in the quarg cheeses were 17.4-34.7% and 7.4-15.0%, resp., depending on process conditions. Rennet addition increased the total solids content, especially when unheated milk was used; however, the corrected (18% T.S.) yield was unaffected. Yoghurt culture resulted in the shortest incubation time (3.8-4.6 h), while the acidophilus culture alone was unsuitable. After whey separation, the concn. of bacteria from all three cultures were higher in the quarg (8.48-9.05 log CFU/g) than in the whey (5.92-7.90 log CFU/g) using either centrifuge or gravity filtration methods. AS

Swiss type cheese

- 1611 Ollikainen (P). Titration-a rapid method for the determination of proteolysis in cheese. *Journal of Dairy Research* 57(1); 1990; 149-150

An acid-base titration for analysis of the products of proteolysis in Swiss type cheese has been described in this study. The titration system was the originally developed for use in silage analysis and applied to cheese. It has proved to be useful, easy and rapid with an accuracy similar to that achieved by colorimetry. The titration from pH 2 to 12 takes about 3 min. For its speed, convenience and extent of information provided, the titration method, even though it does not separate acetic acid from propionic acid is preferred to colorimetric methods for the detn. of proteolysis products and for the study of cheese ripening. MCV

Khoa

- 1612 Bhadania (AG) and Shah (US). Continuous method of khoa manufacture. A new development. *Beverage and Food World* 16(2); 1989; 36-37

The present work was undertaken to study the feasibility of khoa preparation using roller dryer and to judge the quality of khoa manufactured by this method for its various attributes. SRA

Labneh

- 1613 Tamime (AY), Davies (G), Chehade (AS) and Mahdi (HI). The production of 'labneh' by ultrafiltration. A new technology. *Journal of the Society of Dairy Technology* 42(2); 1989; 35-39

It is evident from this study that ultrafiltration can be employed for the production of 'Labneh' by concentrating the

warm yoghurt. The process can be applied for industrial scale production and the level of total solids in the final product may be improved by concn. at higher temp. AS

Milk powder

- 1614 Mettler (AE). Pathogens in milk powders. Have we learned the lessons? *Journal of the Society of Dairy Technology* 42(2); 1989; 48-55

Although the record of the milk powder industry is a good one in respect of product safety, failures have occurred resulting in outbreaks of food poisoning. From studies within the industry and from published case histories it is concluded that there is a widespread awareness of the requirements of good manufacturing practice (GMP) but lapses in attention to detail can, and have, led to potential and actual reduction of product safety. The lessons to be learned from such studies are discussed, including the role of GMP, equipment and building integrity, air quality, product and environmental testing and the use of critical control points. The paper looks briefly at the increasing pressures for greater legislative control on the industry, and the approach of the New Zealand dairy industry to pathogen control is briefly discussed. AS

Wheys

- 1615 Khorshied (MA), Mahfouz (MB), El-sayed (MM) and El-samragy (YA). Utilization of dried sweet whey in the preparation of flavoured jelly and custard. *Die Nahrung* 33(7); 1989; 691-693
- 1616 Pearse (M J) and Mackinlay (AG). Biochemical aspects of syneresis. A review. *Journal of Dairy Science* 72(6); 1989; 1401-1407

Expulsion of whey from curd during cheese manufacture has been reviewed. Syneresis measurement techniques, intrinsic and extrinsic factors are discussed in detail. JSS

- 1617 Queguiner (C), Dumay (E), Cavalier (C) and Cheftel (JC). Reduction of *Streptococcus thermophilus* in a whey protein isolate by low moisture extrusion cooking without loss of functional properties. *International Journal of Food Science and Technology* 24(6); 1989; 601-612
- 1618 Tong (PS), Barbano (DM) and Jordan (WK). Characterization of proteinaceous membrane foulants from whey ultrafiltration. *Journal of Dairy Science* 72(6); 1989; 1435-1442

Membrane foulants in ultrafiltration(UF) have been found

to be alpha-lactoalbumin and several peptides. The peptides do not appear in wheys produced from *Mucor pusillus* protease or unprocessed wheys. JSS

- 1619 Yoshida (S). Preparation of lactoferrin by hydrophobic interaction chromatography from milk acid whey. *Journal of Dairy Science* 72(6); 1989; 1446-1450

Lactoferrin was isolated from 1.8 M ammonium sulphate whey, which has been prepared from bovine milk acid whey, by hydrophobic interaction chromatography using Butyl Toyopearl 650M and by DEAE ion exchange chromatography. The hydrophobic interaction chromatography of 1.8 M ammonium sulphate whey supernatant resulted in concn. of the whey proteins and fractionation into a fraction eluting in deionized water, a fraction eluting in 0.25 M acetic acid, and a fraction eluting in .2 N NaOH. Lactoferrin was contained only in the fraction released by 0.25 M acetic acid from the matrix of Butyl Toyopearl 650M. It is estimated that approx. 80 mg of lactoferrin can be obtained by this method from 1 L of neutralized acid whey. The isoelectric point of lactoferrin is between pH 4.8 and pH 5.3 as determined by isoelectric focusing. AS

Yoghurts

- 1620 Behling (AR) and Greger (JL). Importance of lactose in yoghurt for mineral utilization. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 200-204

Mineral utilization was assessed in mature female rats fed yoghurt-based diets or casein-based diets that contained quantities of sucrose, lactose, or lactose's component sugars (glucose galactose) equivalent to the amount of lactose found in yoghurt and one of two levels of Ca (4 or 8 mg/Ca /g of diet). Ingestion of the high level of Ca depressed the efficiency of absorption of Ca, Mg, and Zn. Although ingestion of purified lactose, but not yoghurt, improved apparent absorption of Mg and Zn, the effect of lactose on Ca absorption is questionable. An effect of lactose on Ca absorption could only be observed among rats fed the high level of Ca if less rigorous statistical tests (LSDs) were applied. Diet digestibility was strongly correlated with apparent absorption of Ca, Mg, and Zn. However, changes in the colon induced by the dietary treatments (i.e. pH and beta-glucuronidase activity of colonic contents) were not correlated to apparent absorption of minerals. AS

- 1621 Lee (S-Y), Morr (CV) and Seo (A). Comparison of milk based and soy milk-based yoghurt. *Journal of Food Science* 55(2); 1990; 532-536

Milk-based yoghurt and soy milk-based yoghurt were formulated from milk, soy milk and activated carbon treated soy milk containing 3-5% (w/w) added whey protein conc. (WPC) or non-fat dry milk (NFDM) and fermented with commercial yoghurt bacteria culture. The activated carbon process was relatively ineffective for removing phenolic compounds and off-flavours from soy milk. WPC and NFDM both functioned well as ingredients for formulating soy milk-based yoghurt products that compared well with milk-based yoghurt in every aspect studied except for a lack of typical yoghurt and acidity flavours and the presence of soy off-flavours. AS

Milk proteins

- 1622 Chobert (J-M), Bertrand-Harb (C), Dalgalarrrondo (M) and Nicolas (M-G). Solubility and emulsifying properties of beta-casein modified enzymatically by trypsin. *Journal of Food Biochemistry* 13(5); 1989; 335-352

Beta A1-casein was treated with TPCK-trypsin to give 3.2, 5.0, 5.8 and 7.4% hydrolysis of the peptide bonds. By sodium dodecyl sulphate-polyacrylamide gel electrophoresis the resulting peptides had apparent mol. wt. in the range 8,000-4,000. Size-exclusion chromatography of hydrolyzed samples showed four major peaks near 15,000, 5,500, 3,500 and 2,500 mol wt., representing 17, 15, 7 and 14% of the material, resp., after 3.2% hydrolysis and 9, 6, 14 and 52% of the material, resp., after 7.4% hydrolysis. Between the extremes 3.2% and 7.4% hydrolysis, a peak near 8,500 mol. wt was present until 5.8% hydrolysis then disappeared after 7.14% hydrolysis to be replaced by a peak near 12,000 mol. wt. Peptides recovered from reversed-phase HPLC were analyzed by detn. of their amino acid comp. and identified in the sequence of beta-casein. After trypsin treatment, the solubility of beta-casein hydrolysates was largely increased at pH 4.0-7.5. The emulsifying activity of the hydrolysates was higher than that of beta-casein in the range of pH 1.5-3.5 and 6.5-10.0, but all the emulsions obtained with trypsin-treated beta-casein were less stable than those obtained with original beta-casein. AS

- 1623 Mannheim (A) and Cheryan (M). Continuous hydrolysis of milk protein in a membrane reactor. *Journal of Food Science* 55(2); 1990; 381-385, 390

Casein was hydrolyzed using Alcalase in a continuous stirred tank membrane reactor (CSTMR) using a hollow fiber ultrafiltration membrane. A design of experiments methodology was used to optimize the four performance variables; enzyme concn., substrate concn., permeate flux and reactor vol. High

conversion (> 90%) of the casein could be achieved after one h at 50 C and pH 8. Reactor activity was most affected by the enzyme-to-substrate ratio. The stability of the reactor (i.e., decay of activity with time) was a function of enzyme leakage through the membrane, thermal inactivation and enzyme-membrane interactions. AS

- 1624 Peri (C), Pagliarni (A), Iametti (S) and Bonomi (F). A study of surface hydrophobicity of milk proteins during enzymic coagulation and curd hardening. *Journal of Dairy Research* 57(1); 1990; 101-108

The formation of hydrophobic sites on the surface of casein micelles as a consequence of rennet action has been followed through the binding rate of a fluorescent probe and its distribution between a free and an 'aggregated' protein fraction. The variation of this parameter has been related to clotting time and curd hardening kinetics. Results show that a first aggregation of casein through hydrophobic sites interaction began as soon as rennet was added to milk. At the natural pH of milk, the sol-gel transition occurred when all the casein micelles were already involved in large aggregates. This was not the case with slightly acidified milk (pH 6.5 and 6.3) where clotting occurred well before the first aggregation step has been completed. The surface hydrophobicity of casein continued to increase in the curd due to continuing enzymic action and structural rearrangements. When this process has been completed the hardening of curd proceeds at an accelerated pace until it reached its max. asymptotic values. AS

Caseins

- 1625 Closs (B), Courthaudon (J-L) and Lorient (D). Effect of chemical glycosylation on the surface properties of the soluble fraction of casein. *Journal of Food Science* 55(2); 1990: 437-439, 461

To optimize the use of caseins as surfactants, the surface tension, foaming capacity and stability of the soluble fraction of casein as a function of different factors; pH, protein concn., polarity (modified by covalent binding of carbohydrates) were studied. Below but near the pH, the surface properties of the casein (foaming capacity and stability, decrease in surface tension) were improved. The glycosylated caseins which were more flexible and more unfolded diffused and absorbed more rapidly at the interface and also had increased foaming capacity and stability. AS

- 1626 Curme (AG), Schmidt (SJ) and Steinberg (MP). Mobility and activity of water in casein model systems as determined by

H NMR and sorption isotherms. *Journal of Food Science* 55(2); 1990; 430-433

Two means of monitoring water availability in casein model systems were compared. Adsorption isotherms of rennet casein and freeze dried casein-sodium chloride (95:5 ratio) were obtained over the water activity range 0.43 to 0.85. Over the entire water activity range the casein-NaCl samples sorbed more water than the casein only samples. Deuterium (^2H) nuclear magnetic resonance (NMR) R_1 and R_2 relaxation parameters were measured in the same casein model systems. A linear relation between water activity and both R_1 and R_2 was observed. However, at equal water activity both R_1 and R_2 values were found to be lower for the casein NaCl system than for the casein only system. This indicated that the water in the NaCl containing system was more rotationally mobile than the water in the system without NaCl at the same water activity. AS

1627 Mistry (A), Steinberg (MP) and Richardson Schmidt (SJ). Comparison of vapour and liquid isotherms for casein and casein sucrose mixture. *Journal of Food Science* 55(2); 1990; 434-436

Hydration by vapour sorption and liquid water addition for the effect on sorption isotherms of casein and a casein-sucrose mixture was compared. Both isotherm data and NMR relaxation rates were obtained from the same samples. Data showed biphasic linear plots with breaks at the same water activity. At a given moisture content, liquid hydration of casein showed a lower water activity and a lower NMR mobility than the vapour sorbed samples. The casein-sucrose mixture showed the opposite. As water activity was increased above 0.90, casein alone showed decreasing difference between vapour and liquid hydration while the mixture showed rapidly diverging lines. These isotherm differences between vapour and liquid hydration were corroborated by NMR. AS

1628 Sanogo (T), Paquet (D), Aubert (F) and Linden (G). Purification of alpha casein by fast protein liquid chromatography. *Journal of Dairy Science* 72(9); 1989; 2242-2246

An enriched alpha_{s1} casein was prepared by batch fractionation of whole casein on DEAE-cellulose using CaCl as eluent. The alpha_{s1} casein fraction was then submitted to hydrophobic interaction chromatography on a semipreparative fast protein liquid chromatography system. Electrophoretically pure alpha_{s1} casein was obtained by eluting with .05 M sodium phosphate at pH 6 and containing 3.75 M urea. AS

- 1629 St-Martin (M) and Paquin (P). Ion-exchange fast protein liquid chromatography. Optimization of the purification of caseins using a non-denaturing detergent. *Journal of Dairy Research* 57(1); 1990; 63-68

The separation of bovine milk proteins by fast protein liquid chromatography has been studied by ion-exchange chromatography on Mono S and Mono Q columns. The use of non-ionic detergent, octyl-glucoside, made possible the separation of the four major casein components (α - s_1 , α - s_2 , beta- and Kappa) as well as minor caseins on the Mono S column using urea-containing buffers at pH 3.5. There was, however, considerable overlap between the α - s_1 and α - s_2 casein peaks. A good resolution was obtained with a low concn. of urea (3.5 M) and detergent (0.1%). These conditions allowed the separation of casein components in their native state in less than 50 min. The purity of isolated Kappa-casein was further improved by a second separation on a Mono Q column. AS

Whey proteins

- 1630 Kasuta (K), Rector (D) and Kinsella (JE). Viscoelastic properties of whey protein gels. Mechanical model and effects of protein concentration on creep. *Journal of Food Science* 5(2); 1990; 516-521

The creep behaviour of gels made using different concn. of whey protein isolate (WPI, > 95% protein) was systematically determined. The creep curves of these gels conformed to a 6 element mechanical model consisting of one Hookean, two Voigt and one Newtonian component. The concn. and temp. dependence of each viscoelastic constant were examined and the data are discussed in terms of mechanisms involved in gel network structure. AS

- 1631 Mottar (J), Bassier (A), Joniau (M) and Baert (J). Effect of heat induced association of whey protein and casein micelles on yoghurt cultures. *Journal of Dairy Science* 72(9); 1989; 2247-2256

Effect of heat denaturation on yoghurt textures has been studied by electron microscopy. Beta-lactalbumin and alpha-lactoalbumin bind to the casein micelles depending upon the extent of heat treatment. Beta-lactoalbumin offered a barrier to micelle infusion thereby causing inferior texture of yoghurt. At higher heat treatments alpha-lactalbumin also commenced to precipitate on casein micelles. It apparently filled the gaps formed by the beta-lactalbumin filaments and caused a smoother micelles surface. The heat induced

association of alpha-lactalbumin with casein particles appeared to be important for fusion and hydration of the micelles during fermentation. JSS

- 1632 Rhim (JW), Jones (VA) and Swartzel (KR). Kinetic compensation effect in the heat denaturation of whey protein. *Journal of Food Science* 55(2); 1990; 589-590, 592

The kinetic compensation effect in the heat denaturation of whey proteins was demonstrated using two different kinetic compensation relationships, i.e. Enthalpy ($\Delta H^\ddagger$)/Entropy ($\Delta S^\ddagger$) compensation and Frequency Factor ($\ln k_0$)/Activation Energy (E_a) compensation. Isokinetic temp. determined by these methods were 84.0 and 87.8 °C, resp. These values were higher than those associated with thermal death of microorganisms caused by heat denaturation of proteins; however, they were in the experimental temp. range, correlating well the dependent relationship between kinetic parameters. AS

- 1633 Rinn (JC), Morr (CV), Seo (A) and Surak (JG). Evaluation of nine semi-pilot scale whey pretreatment modifications for producing whey protein concentrate. *Journal of Food Science* 55(2); 1990; 510-515

Cheese-whey was chemically pretreated and subjected to one of nine semi-pilot scale, physical pretreatment modifications involving various combinations of centrifugal clarification (CC) and/or microfiltration (MF) to remove residual lipids and phospholipoprotein complexes. Two pretreatment modifications were most effective for producing whey with least turbidity and lowest lipid and phospholipid contents. Whey given these two pretreatments provided highest ultrafiltration (UF) membrane flux rate and upon drying of UF retentate resulted in the most highly functional WPCs in terms of solubility, foam expansion, emulsifying activity and gelation. AS

MEAT AND POULTRY

Meat

- 1634 Ahmad (HA) and Marchello (JA). Microbial growth and successions on steak as influenced by packaging procedures. *Journal of Food Protection* 52(4); 1990; 236-239

The influence of retail packaging procedures: (1) Borden's Resinite film overwrap; (2) Gas (1% carbon dioxide, 40% oxygen, 59% nitrogen) flushed for 2 min then overwrapped with the Resinite film; (3) packaged in a barrier bag sealed with

no evacuation of air on microbial growth and succession on steak surface was studied during 12 days of storage at 4 °C. Growth on top and bottom surfaces for all, packaged steaks did not differ significantly within most sampling periods. Similar growth patterns were observed on both steak surfaces, increasing ($P < 0.05$) between days 3, 6, and 9 of storage. *Pseudomonas* dominated the microflora on steaks packaged in all treatments. However, *Pseudomonas* was the dominant organism on the steaks packaged in treatment 3 only through days 6; thereafter the microflora were dominated by *Serratia*. The numbers of *Micrococcus*, *Brochothrix* and coryneforms were also increased with storage time in all treatments. AS

- 1635 Barbut (S) and Mittal (GS). Effect of heating rate on meat batter stability, texture and gelation. *Journal of Food Science* 55(2); 1990; 334-337

The effects of four heating rates (0.31, 0.51, 1.22, and 1.62 °C/min) on the gelation, stability and texture of meat batters containing 2.5 and 1.25% salt were studied. In general, slower heating rates resulted in higher modulus of rigidity (G) values, and salt reduction resulted in lower G values. All the low salt treatments, except the 1.62 °C/min treatment, showed a structural breakdown (above 67 °C) when the scanning rigidity monitor was used. However, in the texture profile analysis (samples cooked to 50, 60, and 70 °C) no structural breakdown was observed. Therefore, special care should be given to interpreting gelation profile results. AS

- 1636 Barbut (S) and Mittal (GS). Effects of salt reduction on the rheological and gelation properties of beef, pork and poultry meat batters. *Rheology and gelation. Meat Science* 26(3); 1989; 177-191

The gelation and rheological properties of beef, pork and poultry meat batters as affected by salt reduction (2.50, 1.25 and 0.00%) were studied by using a Haake rotational viscometer and a thermal scanning rigidity monitor. Beef batters showed a decrease in shear stress with the decrease in salt levels at both high and low shear rates. Pork batter showed a mixed behaviour (no definite trend in shear stress versus shear rate) and the poultry meat batters showed a Bingham pseudoplastic behaviour, except for the no-salt treatment. During heating the beef batters showed the highest G values followed by the pork and the poultry meat batters. The rigidity modulus profiles exhibited two major transition, temp. at 47-53 °C. and at 64-76 °C. Beef batter with 2.50% salt developed the highest average G values (16.6 KPa) and the poultry batter with 2.50% salt the lowest (7.3 kPa). AS

- 1637 Isaksson (T), Ellekjaer (MHR) and Hildrum (K). Determination

of the previous maximum temperature of heat-treated minced meat by near infrared reflectance spectroscopy. *Journal of the Science of Food and Agriculture* 49(3); 1989; 385-387

Detn. of the heat treatment given to minced meat has been explored on a preliminary basis by near infrared reflectance (NIR) analysis. Minced meat samples from beef were heated at five different temp. from 50 to 95 C. Correlating NIR-determined temp. ranging against actual lab. treatment temp. gave correlation coeff. of 0.987 for 'wet' meat and 0.992 for freeze dried meat samples. The min. root mean square of detection errors obtained were 3.9 C. for 'wet' meat and 2.5 C for freeze dried meat samples. AS

- 1638 Ivanova (S), Popov (N), Somov (G) and Obretenov (T). In vitro cytotoxicity of melanoidins isolated from baked meat and fish samples. *Die Nahrung* 33(10); 1989; 919-922 (De).

A study has been undertaken to investigate the biological activity of melanoidins isolated from meat samples baked according to Kuntscheva (electro baking oven, 200-300 C, 60-210 min) and from semi-finished meat products baked in swimming fat (200 C 3 x 50 min, repeated use of the oil) as well as from semi-finished fish products (190 C, 60 min). A weak toxicity of the melanoidins formed within a longer thermal treatment, but no mutagenic effect was stated. The cytotoxic alterations showed no specific character. AS

- 1639 Izumi (K), Cassens (RG) and Greaser (ML). Reaction of nitrite with ascorbic and its significant role in nitrite-cured food. *Meat Science* 26(2); 1989; 141-153

The decrease in concn. of free nitrite in an aqueous reaction solution made by mixing nitrite and ascorbic acid was studied. This decrease resulted in formation of a reaction product which transferred NO to ferricytochrome c to form ferrocycytochrome c nitroso compound. From the solution containing the reaction product, nitrite could be regenerated spontaneously and suddenly by physical agitation. Oxygen was apparently not necessary for regeneration of nitrite from the reaction solution. It does not seem that the regeneration of nitrite was responsible for a biomolecular dismutation of nitrosoascorbic acid in a reverse direction proposed by Fox and Thomson. Heating of the reaction solution at less than 100 C resulted in a loss of nitrite from the solution, which was greater with increasing concn. of ascorbic acid. The reaction product formed between nitrite and ascorbic acid is probably responsible not only for nitrosation reactions, but also for the loss of nitrite observed during curing of meat. AS

- 1640 Johnson (JL), Doyle (MP) and Cassens (RG). Incidence of *Listeria* sp. in retail meat roasts. *Journal of Food Science* 55(2); 1990; 572, 574

Interior muscle cores from 50 beef, 50 pork, and 10 lamb roasts, purchased at retail, were assayed for *Listeria* spp., which was isolated from three beef roasts and three pork roasts, but not from lamb roasts. Five isolates of serotype Ia *Listeria monocytogenes* were obtained from the roasts, together with one strain each of *Listeria innocua* and *Listeria welshimeri*. Twice, *L. monocytogenes* was present at 10 CFU/g; all other isolations of *Listeria* spp. required enrichment (< 10 CFU/g). The presence of *Listeria* in cores of whole-muscle meat roasts is probably not a result of environmental contamination, and may be due to antemortem exposure of the animal to *Listeria*. AS

- 1641 Kormendy (L), Mihalyi (V), Zukal (E) and Csiba (A). Comparison of analytical methods. *Meat Science* 26(3); 1989; 193-207

A technique for comparing two analytical methods is presented in this paper. Frequently a new method, generally simpler, faster or less expensive, is compared with a reference method. The deterministic relationships between two methods, subject only to random errors, if first discussed. However, the relationship between two methods may be stochastic (non-deterministic); this problem is also discussed here. The concept of the sensitivity ratio of Mandel furnishes an appropriate basis of comparison. The use of the correlation coeff. may be completely erroneous for this purpose. Tests are presented for the significance of constants in the regression equation. Dangers in the use of stochastic relationships are strongly emphasized because of the unstable estimation of constants in the regression formula. Some systematizing principles not generally known by food scientists are presented here. AS

- 1642 Lee (Y-Z), Wang (RM) and Nakai (S). Preparation of colourless globin from bovine hemoglobin using sodium alginate. *Journal of Food Science* 55(2); 1990; 577-578

- 1643 Mills (EW), Smith (SH) and Judge (MD). Early post-mortem degradation of intramuscular collagen. *Meat Science* 26(2); 1989; 115-120

Post-mortem changes in physical and thermal stabilities of bovine intramuscular connective tissue were studied during the first 24 h post-mortem. Collagen thermal shrinkage temp. (T_s) decreased ($P < 0.01$) and collagen solubility increased ($P < 0.01$) during the first 24 h following slaughter with greatest amount of change occurring in the first 8 h post-

mortem. The dynamic nature of intramuscular connective tissue during the very early post-mortem (VEP) period is compared to the VEP-tenderness relationships proposed by Marsh and others. AS

- 1644 Swatland (HJ). Thermal denaturation of perimysial collagen in meat measured by polarized light microscopy. *Journal of Food Science* 55(2); 1990; 305-307, 311

The feasibility of using the de Senarmont method to study the loss of birefringence in septa of perimysium as transverse sections of meat were heated with a hot stage was shown. Samples were from beef, pork and turkey from 1 to 5 days postmortem. Although there were considerable differences between different types of samples, from 20 to 67 C, there was generally only a slight decrease in path differences (overall mean, -0.04 nm/C). From 67 C to about 85 C all samples had a sharp and largely irreversible decrease in path differences (overall mean, -0.58 nm/C) concurrent with thermal denaturation. AS

- 1645 Youssef (MM). Formulation, acceptability, chemical composition and In vitro digestibility of novel snack food and meat ball analogue. *Qualitas Plantarum - Plants Foods for Human Nutrition* 38(3); 1988; 243-249

Potato puree and wheat flour were blended at a ratio of 7:1 w/w with 2 parts per wt. of soybean protein conc. (SPC) and/or faba bean-protein micellar mass (PMM). Two snack foods were formulated and deep fried. Spices, onions, parsley and chicken stock were added to the aforementioned two recipes to formulate meat ball analogues. Data revealed good acceptability of all products. Moreover, they can be considered as a good source for some essential amino acids protein (-26%); lipids (-20-%); carbohydrates (-48%) and minerals. The in vitro digestibility ranged between 61.0% and 66.9%. AS

Beef

- 1646 Boyle (DL), Sofos (JN) and Schmidt (GR). Thermal destruction of *Listeria monocytogenes* in a meat slurry and in ground beef. *Journal of Food Science* 55(2); 1990; 327-329
- 1647 Dainty (RH), Edwards (RA) and Hibbard (CM). Spoilage of vacuum-packed beef by a *Clostridium* sp. *Journal of the Science of Food and Agriculture* 49(4); 1989; 473-486
- 1648 Larick (DK) and Turner (BE). Flavour characteristics of forage- and grain-fed beef as influenced by phospholipid and fatty acid compositional differences. *Journal of Food Science*

55(2); 1990; 312-317, 368

- 1649 Mann (TF), Reagan (JO), Johnson (LP), Lyon (CE), Mabry (JW) and Miller (MF). Textural and chemical characteristics of recombined precooked beef chuck roasts as influenced by boning time and salt level. *Journal of Food Science* 55(2); 1990; 330-333
- 1650 Spanier (AM), McMillin (KW) and Miller (JA). Enzyme activity levels in beef. Effect of postmortem aging and end-point cooking temperature. *Journal of Food Science* 55(2); 1990; 318-322

Beef steaks

- 1651 Crouse (JD) and Koohmaraie (M). Effect of freezing of beef on subsequent postmortem aging and shear force. *Journal of Food Science* 55(2); 1990; 573-574
- 1652 Unda (JR), Molins (RA) and Walker (HW). Microbiological and some physical and chemical changes in vacuum-packaged beef steaks treated with combinations of potassium sorbate, phosphate, sodium chloride and sodium acetate. *Journal of Food Science* 55(2); 1990; 323-326
- 1653 Wheeler (TL), Miller (RK), Savell (JW) and Cross (HR). Palatability of chilled and frozen beef steaks. *Journal of Food Science* 55(2); 1990; 301-304
- 1654 Wheeler (TL), Seideman (SC), Rolan (TL) and Davis (GW). Effects of mechanically separated beef with various chloride salts in restructured beef steaks. *Journal of Food Science* 55(2); 1990; 342-345

Mutton

Goat

- 1655 Park (YW). Effect of breed, sex and tissues on concentrations of macrominerals in goat meat. *Journal of Food Science* 55(2); 1990; 308-311

Macromineral concn. in liver, Longissimus dorsi (LD) and Biceps femoris (BF) muscles of doelings and bucks from 2 breeds of goat were determined to study effects of breed, sex, tissue and their interactions on the levels of P, S, K, Ca, Mg and Na in caprine meat. Effect of breed and sex were minimal, but breed x sex interaction had significant influence on levels of K and Mg. Tissue effect was most prominent except for S content. Liver and significantly greater P, Ca and Na contents than skeletal muscles, whereas the former had

slightly lower S and significantly lower K and Mg than the latter. Correlations among the levels of the minerals for the liver were different from those for the skeletal muscles. AS

Sheep

Lambs

- 1656 Rhee (KS), Ziprin (YA) and Papadoopoulos (LX). Sensory and cooking properties of lamb chops cooked with and without external fat and epimysium. *Journal of Food Science* 55(2); 1990; 570-571

When lamb loin chops with or without 0.64 cm subcutaneous fat layer and epimysium (fat-on or fat-off chops) were broiled to an internal temp. of 77 °C, cooking losses were higher ($P < 0.05$) for fat-off chops than for fat-on chops. The concn. of ether-extractable fat (g/100 g cooked lean) was also higher for the cooked lean from fat-off chops while the opposite was observed for moisture. Sensory properties of the cooked lean were adversely affected by the removal of subcutaneous fat before cooking. TBA-reactive substances in a given amount of the cooked lean, after 4 days of storage at 4 °C, were slightly higher ($P < 0.10$) for the lean from fat-off chops than for the lean from fat-on chops. AS

Pork

- 1657 Sawaya (WN), Mameesh (MS), El-Rayes (E), Husain (A) and Dashti (B). Detection of pork in processed meat by an enzyme-linked immunosorbent assay using anti-swine antisera. *Journal of Food Science* 55(2); 1990; 293-297

Rabbits

- 1658 Coppings (RJ) and Godwin (SL). Effects of freezing on physical properties and sensory characteristics of meat from fryer and senior rabbits. *Journal of Food Science* 55(2); 1990; 568-569

The effects of age (fryer vs senior) and freezing (fresh vs frozen) on the physical properties and sensory characteristics of loin meat from domestic rabbits were examined using a 2 x 2 factorial exp. Freezing resulted in a decline in moisture and an increase in protein. Total cooking loss tended to be greater from carcasses which had been frozen. Shear values of fresh meat from fryer carcasses were significantly less than those from senior carcasses. Water-holding capacities exhibited no differences. Taste panelists judged meat from fresh fryer carcasses more tender and juicier than that from senior rabbits. Flavour differences were not detected. AS

Products

- 1659 Urbanyi (G) and Palfi (Z). Investigation into the interaction between sensory properties in meat products. I. Relationship between colour and taste sensation and colour as measured objectively and sensorily observed. *Acta Alimentaria* 18(2); 1989; 127-141

Bacon

- 1660 Costello (CA), Morris (WC) and Barwick (JR). Effects of heating bacon and sausage in non-woven, melt-blown material. *Journal of Food Science* 55(2); 1990; 298-300
- 1661 Mazhar (A), Busboom (JR), Field (RA), Rule (DC), Heald (T), Russell (WC) and McCormick (RJ). Functional characteristics, fatty acid composition, and palatability of bacon from pigs fed canola. *Journal of Food Science* 55(2); 1990; 575-576

Bologna

- 1662 Claus (JR), Hunt (MC), Kastner (CL) and Kropf (DH). Low-fat, high added water bologna. Effects of massaging, preblending, of time of addition of water and fat on physical and sensory characteristics. *Journal of Food Science* 55(2); 1990; 338-341, 345

The low-fat, high added water bologna (10% fat-30% added water) had lower values for Instron TPA and tensile strength and higher values for cohesiveness, springiness, and cooking and purge losses than the control (30% fat-10% added water). Massaging of low-fat formulations tended to increase Instron TPA values compared with preblended or nonpreblended low-fat bologna. Low-fat products produced by massaging with all of the added water but none of the added fat had less purge during storage than low-fat treatments that were not massaged. However, none of the low-fat processing regimens produced bologna with sufficient water-binding capacity necessary to maintain cooking losses of less than 6% and purge accumulation less than 2%. AS

Ham

- 1663 Lin (KW), Keeton (JT), Craig (TM), Gates (CE), Gamble (HR), Custer (CS) and Cross (HR). Physicochemical composition of dry-cured ham processed under minimal aging time-temperature conditions. *Journal of Food Science* 55(2); 1990; 285-288
- 1664 Lin (KW), Keeton (JT), Craig (TM), Huey (RH), Longnecker (MT), Gamble (HR), Custer (CS), Cross (HR). Bioassay analysis of

dry-cured ham processed to affect *Trichinella spiralis*.
Journal of Food Science 55(2); 1990; 289-292, 297

Poultry

Chickens

- 1665 Hart (MR), Huxsoll (CC), Tsai (LS), Ng (KC), King (AD), Jones (CCJr) and Halbrook (WU). Microfiltration of chicken process waters for reuse. Plant studies and projected operating costs. **Journal of Food Process Engineering** 12(3); 1990; 191-201

Commercial scale ceramic microfilters were used in plant tests to determine flux rate and operating parameters for waters from a poultry scalding, a poultry chiller, and brine from a delicatessen products chiller, under commercial conditions. Filtration produced clear permeate from all waters. Microorganisms counts were essentially reduced to zero in scalding and chiller water permeates, with BOD reduced by about 70% in scalding water permeate and about 60% in chiller water permeate. Flux rates were in the range of 224-204 L/m² h for scalding water at 54 °C and 114-81 L/m² h for chiller water at ambient temp. Test results were used to project nonlabor operating savings and/or costs resulting from the use of microfiltration to recondition and reuse bath overflow. For a processing rate of 140 birds/min and bath size of 37,850 L (10,000 gal), an annual savings of 21,000-26,000 were estimated for scalding water filtration, while annual costs of 65,00-84,000 were estimated for chiller water filtration. For a deli brine size of 1,170 L (300 gal), annual costs of about 700 were estimated. Retentate heating and electrical usage associated with centrifugal filter pumps were projected as predominant cost factors. Besides costs, other factors such as nonchemical control of microbial growth, water savings, and reduced discharge levels may also be important reasons for considering microfiltration. AS

- 1666 Kondaiah (N) and Panda (B). Effect of phosphate and spent hen yolk on the quality of chicken sausage from spent hens. **Poultry Science** 68(3); 1989; 393

Spent hens were hand deboned within 3 h of slaughter to obtain meat and by-products (skin, gizzard, heart, and cooked meat). Effects of four treatments of quality and acceptability of two chicken sausage formulations were evaluated: 1) no additions (control); 2) 5% phosphate; 3) 3% spent hen yolk; 4) 1.5% phosphate + 3% spent hen yolk. Formulation 1 contained meat (100%) whereas formulation 2 contained meat (66.5%) and by-products (33.5%). Addition of phosphate plus yolk increased pH, decreased fat separation resulted in better stability of the emulsion, and decreased

cooking loss of sausages, which result in higher acceptability in both formulation; addition of phosphate alone resulted in the max. desirable effect in formulation 1. Addition of both phosphate plus yolk was necessary for the max. desirable effect in formulation 2. Addition of spent hen yolk compensated for the by-products in formulation 2 in the presence of phosphate. Addition of yolk alone was not beneficial in formulation 1, although in formulation 2 the addition was beneficial to some extent. Spent hen yolk could profitably be used to produce chicken sausages of better quality from spent hens. AS

- 1667 Kozlowski (M), Faruga (A), Mikulski (D), Bock (H (D), Kozłowska (H), Rotkiewicz (D) and Kozłowski (K). Fattening and slaughtering results in broiler chicken fed diets containing rapeseed meal double zero-varieties. *Die Nahrung* 33(7); 1989; 617-623 (De).

The results obtained in fattening and slaughtering show that the share of rapeseed meal from double-zero var. in diets for broiler chicken may amount to 10% from 1st to 21st day and 15% from 22nd to 56th day rearing. AS

Broilers

- 1668 Smith (DP) and Fletcher (DL). Compositional and biochemical variations within broiler breast muscle subjected to different processing methods. *Poultry Science* 67(12); 1988; 1702-1707

Three exp. were conducted to evaluate the chem. and biochemical comp. of broiler breast meat as a function of intramuscular locations and different processing treatments. Birds were obtained from a commercial processing plant and killed via cervical dislocation. The breast meat was removed (1) immediately post-mortem (hot-boned, HB), (2) immediately removed and chilled 24 h (hot-boned and aged HB-A) or (3) conventionally processed (chilled 24 h prior to breast meat removal, CP). Meat samples were removed from the anterior, middle, and posterior areas of the *Pectoralis major*, and from the anterior and posterior areas of the *P. minor*. In exp. 1 samples were analyzed for percentage moisture, protein, lipid, and ash and residual glycogen content after storage. In Exp. 2 and 3 lactate and glycogen contents were determined immediately for the CP and HB treatments only. No significant differences in moisture, protein, lipid, ash and residual glycogen were found by location within either of the breast muscles in exp. 1. The HB and HB-A muscles had significantly higher moisture contents (73.0 and 73.5%) than CP muscle (72.1%), but no difference in protein, lipid, or ash was detected on a dry wt. basis. In exp. 2 and 3 glycogen content tended to be greater in the posterior location of the *P. major*

only and lactate greater in the posterior location of the CP treatment of Exp. 3 only. No differences were noted for either glycogen or lactate by location within the P. minor. AS

Poultry products

Eggs

- 1669 Talukdar (JK) and Nandre (SB). Egg breakage-a major cause for increase in egg prices. *Poultry Guide* 27(4); 1990; 37-43

Egg breakage in India happens due to poor transportation system and also due to lack of storage facility. The 14 factors listed by the author for egg breakage include chicken strain, age, floor, nests, environmental temp., diseases, feeding level and type of nutrition, extent of availability of Ca, time of Ca intake and provision of vitamins and oviposition time. Collection, handling, cleaning, grading and storage also contribute for breakage. The check list with 27 items listed helps as a guide to prevent egg breakage. AR

Egg products

- 1670 Izat (AL) and Gardner (FA). Incidence of *Campylobacter jejuni* in processed egg products. *Poultry Science* 67(10); 1988; 1431-1435

Egg samples were obtained from two commercial egg-processing facilities to determine if *Campylobacter jejuni* could be isolated from the raw product or from further-processed egg products intended for human consumption. No *C. jejuni* were detected in any of the egg or egg-product samples or from water samples collected from the overflow of the egg washer. *Campylobacter jejuni* was recovered from all control samples, which had been inoculated at the plants. These findings suggest that properly processed egg products are an extremely unlikely source of *C. jejuni* contamination. AS

Egg whites

- 1671 Kato (A), Ibrahim (HR), Watanabe (H), Honma (K) and Kobayashi (K). Structural and gelling properties of dry-heating egg white proteins. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 32-37

Gel strength of dried egg white greatly increased by heating in the dry state at 80 C. The structural changes responsible for the enhancement of gel strength were studied. Heat-induced gelation of dry heated egg white in the presence of denaturing reagents resulted in a decrease of gel strength

in the order SDS > urea > 2-mercaptoethanol. CD spectra revealed only little changes in the secondary structure of some egg white proteins upon dry-heating, except ovotransferrin. Proteolytic digestibility of ovalbumin and ovotransferrin increased progressively with an increase of dry-heating time, indicating enhancement of protein flexibility by such heating in the dry state. DSC thermograms showed that enthalpy of denaturation (ΔH) of dried egg white was markedly decreased with an increase of dry-heating time. In parallel, the Gibbs free energy of unfolding in water (ΔG) was also found to decrease at approx. the same rate as (ΔH). A good correlation was obtained between the decrease in ΔH and the increase in gel strength of egg white proteins heated in the dry state. AS

Egg yolk

- 1672 Warren (MW) and Davis (DR). Processing and sensory evaluation of scrambled eggs containing defatted yolk solids. *Journal of Food Science* 55(2); 1990; 583-584

Egg yolk solids defatted with hexane were incorporated in to frozen and spray-dried scrambled egg products. Part of the egg oil removed was replaced with nonfat oil replacers. Both products were evaluated by sensory panels. The frozen product was compared with frozen whole egg and a non-yolk, commercial frozen product. The spray-dried product was compared with a non-yolk, commercial dried product. In the frozen products, the whole egg was preferred over both the defatted frozen product and nonyolk, commercial frozen products, with the defatted and nonyolk products being equally acceptable. In the dried products, the spray-dried scrambled eggs were preferred over the nonyolk, commercial dried product. The products formulated from defatted yolk solids contained 84% less lipid and 79% less cholesterol than products made from fresh whole eggs. AS

Quail eggs

- 1673 Kondajah (N) and Panda (B). A new method for measuring internal quality of quail eggs. *Poultry Guide* 27(4); 1990; 95-96

A formula similar to Haugh units for hen eggs has been developed for quail eggs by taking into consideration egg wt., albumen height, and yolk height. The formula for determining the internal quality unit of quail eggs is $IQU = 100 \log (H + 4.18 - 0.8989 W^{0.6674})$ where H is albumen height (in mn) and W is egg wt. Correlation between IQU and albumen height was very high (0.85) but between IQU and egg wt. was very low (-0.01). The disadvantage with IQU is either over estimated or

under estimated egg quality. KAR

SEAFOODS

- 1674 Ishitani (T). Packaging of processed seafoods. *Packaging Japan* 10(54); 1989; 29-33

This paper highlights the existing conditions in the packaging of processed seafoods in Japan. The current status of packaging, technologies for packaging processed seafoods, and for controlling the growth of microorganisms (retort, aseptic packaging, gas packaging) are the aspects covered. SRA

- 1675 Negishi (S) and Karmbe (I). An enzymatic assay method for IMP determination using IMP dehydrogenase and an application of the principle to a test paper method. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(9); 1989; 1591-1597

An enzymatic assay method for IMP detn. was developed by using IMP dehydrogenase purified from *Escherichia coli* diaphorase, NAD, thiazolyltetrazolium bromide, and others. An application of this method to the IMP-test paper method was also tried. By this colorimetric method, IMP in fish muscle could be determined very accurately. The coeff. of variation and recovery were 0.2-2.5% and 95-108%, resp.; the correlation coeff. between measurements by this method and HPLC method was 0.996 (n=24). As an application, a test paper was devised. A sheet of filter paper was soaked into a solution containing the two kinds of enzyme, NAD, iodonitrotetrazolium chloride, and the inhibitor of lactate dehydrogenase, this procedure was followed by freeze-drying. The K-value (a freshness index of fish) was measured rapidly and easily using a muscle homogenate with a combination of this IMP

- 1676 Wooton (M), Silalahi (J) and Wills (RBH). Amine levels in some Asian seafood products. *Journal of the Science of Food and Agriculture* 49(4); 1989; 503-506

A range of 20 Asian seafood products (salted, dried and canned fish, prawns, oysters, squid and jelly fish) were analysed for volatile and non-volatile amines, by HPLC. Results indicate that dried fish products contained putrescine and cadaverine at levels upto approx. 2.2 and 3.3 g/Kg⁻¹ resp. and in one instance, 0.803 g histamine Kg⁻¹. One canned mackerel samples had high concn. of both volatile and non-volatile amines. SRA

Carps

- 1677 Sakaguchi (M), Murata (M) and Kim (J-B). The effect of repeated freeze-thaw cycle on torrymeter readings of carp fillets. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(9); 1989; 1665

The effect of repeated freeze-thaw cycles on torrymeter readings (TMR) have been studied on carp (*Cyprinus carpio*) fillets. These were subjected to 0, 2, and 3 cycles of freeze-thaw TMR measurements made and plotted against storage in ice (of fillets which had undergone 0 to 3 freeze thaw cycles). TMR of fillets without any freeze-thaw cycles decreased very slowly with decrement of 1.0 unit over 15 days; fillets subjected to repeated freeze-thaw cycles exhibited a decrease in TMR by 3 units for the first cycle, followed by 2 units each for the second and third cycle. The decrement in carp fillets, however, was much less than that in yellow tail fillets (about 11 units) stored similarly. This might be due to the difference in the dielectric property of the body surface of the fish sp. The decrease in TMR caused by the repeated freeze-thaw cycle strongly suggests that the torrymeters can be applied to determine the number of such cycle during ice storage of carp fillets; and torrymeters are not useful for measuring the freshness of carp fillets stored in ice; Organoleptically the quality of ice stored (15 days) fillets was appreciably low while TMR values fell extremely slowly over the same period. SGB

Clams

- 1678 Sirkar (LN) and Mishra (R). A comparison of methods for shucking clams. *International Journal of Food Science and Technology* 24(6); 1989; 659-663

Crabs

- 1679 Hollingworth (TA), Wekell (MMJr), Sullivan (JJ), Torkelson (JDJr) and Throm (HR). Chemical indicators of decomposition for raw surimi and flaked artificial crab. *Journal of Food Science* 55(2); 1990; 349-352

Raw surimi and a surimi-derived flaked artificial crab were stored at 4, 10, and 22 C until advanced decomposition occurred. The raw surimi and the flaked artificial crab remained at an acceptable level of quality based on sensory analysis for approx. 2-4 days and 6-8 days, resp., when stored at 10 C. Both products were of acceptable quality for at least 13 days when stored at 4 C. The potentials of total volatile acids (TVA) and total volatile bases (TVB) determined by flow injection analysis, ethanol determined by headspace gas

chromatography and the amines, cadaverine, putrescine, and histamine all determined by HPLC, were evaluated as chemical indicators of decomposition for those products. TVA and TVB appeared to have the most potential as indicators of decomposition. AS

- 1680 Jaswal (AS). Amino acids hydrolysate from crab processing waste. *Journal of Food Science* 55(2); 1990; 379-380, 397

Variables affecting acid hydrolyates were investigated for their efficacy in producing high quality amino acid hydrolysates from crab waste protein for its potential use in specialized animal feed and other food products. In a preliminary trial, 5N HCl was found to be a suitable hydrolyzing agent based on the presence of nihydrin-positive substances. Amino acid yields from a 12 h hydrolysis time varied from about 28-31%, increased marginally to 29-32% with 24 h of hydrolysis, but decreased with hydrolysis time in excess of 24 h. Depending upon hydrolysis time, approx. 42-44% of the total amino acids were essential amino acids: principally leucine, arginine, valine, and threonine. The remaining non-essential amino acid fraction was composed mainly of glutamic acid, aspartic acid and glycine. AS

Oysters

- 1681 Bucknavage (MW), Pierson (MD), Hackney (CR) and Russell Bishop (J). Thermal inactivation of *Clostridium botulinum* type E spores in oyster homogenates at minimal processing temperatures. *Journal of Food Science* 55(2); 1990; 372-373, 429

D-values of *Clostridium botulinum* type E in oyster homogenates were calculated from the slopes of survivor curves for each variable tested (control, 1.0% NaCl, 0.13% potassium sorbate (KS), and a combination of NaCl and KS) at five temp. Mean D-values ranged from 0.78 min at 80 C to 7943 min at 50 C. The addition of salt and/or KS affected heat resistance of the spores, but differences were not consistent among the temp. tested. z-Values calculated for the curve between 70 and 80 C ranged from 6.9 C to 7.6 C, while z-values calculated for the curve between 55 and 70 C were 12.1 - 14.7 C. These data indicate that *C. botulinum* type E would survive in oysters that are minimally processed. A suitable process could be determined using the data presented; however, oysters would have a cooked appearance. AS

- 1682 Shiau (CY) and Chai (T). Characterization of oyster shucking liquid wastes and their utilization as oyster soup. *Journal of Food Science* 55(2); 1990; 374-378

Liquid wastes including shell liquor, bled liquor, original liquor and wash water were collected from lab. and commercial oyster shucking operations and were characterized physically and chemically. These liquid wastes contained 0.01 to 0.36% non-protein-N components, 0.03 to 0.44% total-N, 0.13 to 1.64% salt and an identical protein profile with mol. wt. around 20 KD to 25 KD as major proteins. Total solids could be used to predict the levels of total-N, non-protein-N, ash, salt, total suspended solids and COD. Steam-jacketed kettle heating was an easy method to conc. liquid wastes for production of oyster soup. Chemical, physical and sensory properties of processed oyster soup were analyzed and compared with a commercial product. AS

Prawns

- 1683 Lalitha (KV), Unnithan (GR) and Iyer (KM). Distribution of *Clostridium perfringens* in fishes and prawns. *Fishery Technology* 27(1); 1990; 64-68

Fifty two fish and 14 prawn samples were collected from the local landing centres and markets. 47 of the total 66 samples shows the presence of *Cl. perfringens*. *Cl. perfringens* was detected in 70% of the total samples on the skin/shell surface. Only 40% of the total samples showed presence of *Cl. perfringens* in the guts. Chi square test indicated that the incidence of *Cl. perfringens* in fish and prawn are different. Incidence of *Cl. perfringens* was high in prawn than in fish but the count in guts of fishes and prawns are similar. KAR

Shrimps

- 1684 Gopalakrishna Iyer (TS) and Varma (PRG). Source of contamination with *Salmonella* during processing of frozen shrimps. *Fishery Technology* 27(1); 1990; 60-63

Sources like water, ice, floor, utensils, and table tops, were examined for the presence of *Salmonella* serotypes. Serotypes found were: cultured pond: *S. farmen* and *S. weltevreden*; mud from cultured pond: *S. newport*; coastal sea water; *S. havana*; sea beach sand; *S. weltevreden*; and *S. barielly*; process water: *S. typhimurium*; ice: *S. barielly*; floor of pre-processing unit: *S. barielly* and *S. weltevreden*; utensils: *S. weltevreden*; droppings of wall lizards; *S. weltevreden*; droppings of rodents seen over the processing table *S. weltevreden*, and *S. typhimurium*. KAR

- 1685 Rao (CVN) and Srinivasa Gopal (TK). Alternative transport package designs for 2 kg blocks of frozen shrimp. *Fishery Technology* 27(1); 1990; 79-80

Currently shrimps from India are shipped to Japan by placing 10 numbers of 2 kg frozen shrimp in waxed duplex board cartons, in a corrugated fibre board master case making a gross wt. of about 23 kg. The cost of master cases used for shipping would be around Rs. 19 million. A new package in which the size and style are changed to hold 12 unit cartons in 3 x 4 fashion to save the board area has been developed. The cuboid shape facilitates easy handling and better stacking. Details of construction of the currently used master case and those of newly suggested are diagrammatically represented. KAR

Squids

- 1686 Kuo (J-D), Peleg (M) and Hultin (HO). Tensile characteristics of squid mantle. *Journal of Food Science* 55(2); 1990; 369-371, 433

The mechanical properties of cooked and uncooked mantles of *Loligo pealei* and *Illex illecebrosus* in uniaxial tension were characterized by strength, strain at failure, overall stiffness and curvature of corrected stress vs strain relationships which is associated with degree of strain hardening. All four parameters differed at different orientations to the squid's principal axis. Uncooked mantle was considerably stronger and stiffer in the longitudinal direction, showed a higher degree of strain hardening, but sustained a smaller prefailure strain. Cooking at 60 and 100 C had a much more drastic effect on the mechanical behaviour of longitudinal specimens than on the transverse. These anisotropic mechanical features are attributed to the orientation of the collagen fibers of squid. AS

Fish

- 1687 Gennari (M), Alacqua (G), Ferri (F) and Serio (M). Characterisation by conventional methods and genetic transformation of Neisseriaceae (genera *Psychrobacter* and *Acinetobacter*) isolated from fish and spoiled sardines. *Food Microbiology* 6(4); 1989; 199-210

A total of 366 aerobic Gram-negative non-motile coccobacilli, isolated from Mediterranean fresh and spoiled sardines, was tested by conventional biochemical characters and transformation assays. Thirty-eight strains were identified with *Acinetobacter* (mostly biotype *lwoffii*). The remaining oxidase-positive strains, although showing some characters in common with *Moraxella phenylpyruvica* and *Moraxella osloensis*, were more similar to *Psychrobacter immobilis* in many features. In fact, DNA from 98 *Moraxella*

like strains (of 100 tested) were able to transform with different efficiencies of transformation to prototrophy cells of a single auxotroph mutant of *Psychrobacter immobilis*. It therefore appears obvious to consider, as members of the genus *Psychrobacter*, the greater part of the strains previously identified as *Moraxella* or *Moraxella*-like in earlier studies on seafood microflora. *Psychrobacter* and *Acinetobacter* can develop lipolytic activity during the storage of fish. AS

- 1688 Korhonen (RW), Lanier (TC) and Giesbrecht (F). An evaluation of simple methods for following rigor development in fish. *Journal of Food Science* 55(2); 1990; 346-348, 368

Measurements obtained with a simple rigorometer (muscle tension measuring device) were found to correlate well with measurements of the relative ATP/IMP content ratio (258/250 nm absorbance ratio of perchloric extracts), muscle pH and visual measurements of stiffness in whole fish (tilapia, *Areochromis aureus*) during rigor development. These simple tests yielded measurements which clearly differentiated the effects of ante-mortem stress on the rate of onset of rigor mortis and associated biochemical changes in the fish muscle. AS

- 1689 Narayanan Nambiar (V) and Mahadeva Iyer (K). Microbial quality of fish in retail trade in Cochin. *Fishery Technology* 27(1); 1990; 51-59

Fresh fish of 24 different sp. were regularly collected from Cochin (India) retail markets and frozen fish were collected from the cold storages in Cochin and analysed for microbial quality. 49.4% of fresh fish and 4.7% of frozen fish examined had total plate counts of $> 5.0 \times 10^5$ / g. *Escherichia coli* was detected in 89.8% of fresh fish and 86.6% of frozen fish and their numbers were > 20 /g in 78.2 and 21.2% of fresh and frozen fish resp. Faecal streptococci were detected in all samples of fresh fish and 87.4% of the frozen fish and their corresponding numbers were > 1000 /g in 60.3 and 11% of fresh and frozen fish resp. *Salmonella* was detected in 5.8 and 8.7% of the fresh and frozen fish, resp. KAR

- 1690 Toyohara (H), Sakata (T), Yamashita (K), Kinoshita (M) and Shimizu (Y). Degradation of oval-filefish meat gel caused by myofibrillar proteinase(s). *Journal of Food Science* 55(2); 1990; 364-368

The textural degradation of oval-filefish meat gel accompanying the increase of peptides and the breakdown of myosin heavy chain was caused by proteinase(s) tightly associated with myofibrils. Leupeptin and n-butanol inhibited the proteolytic activity to some degree. The existence of an endogenous inhibitor for the proteolytic activity in the

sarcoplasm was also demonstrated. AS

Catfish

- 1691 Sirkar (LN), Seshadari (HS) and Fazal (AA). Changes in lipids and proteins of marine catfish (*Tachysurus dussumieri*) during frozen storage. *International Journal of Food Science and Technology* 24(6); 1989; 653-658

Changes in lipids and protein of marine catfish (*Tachysurus dussumieri*) were followed over a period of 300 days storage at -20 C. Phospholipids decreased and free fatty acids (FFA) and peroxide value (PV) increased. A linear relationship between the decrease in phospholipid and increase in FFA was observed, suggesting that FFA were formed by hydrolysis of phospholipid. Fatty acid analysis showed that polyunsaturated fatty acids (PUFA) increased in the neutral lipid fraction and decreased in the phospholipid fractions; this also suggests hydrolysis of the latter and release of free PUFA into the neutral fraction. A decrease in water soluble protein (WSP) and salt soluble protein (SSP) indicated denaturation of proteins on prolonged frozen storage; both changes were strongly associated with the changes in peroxide value and free fatty acids. AS

Cod

- 1692 Boismenu (D), Lepine (F), Gagnon (M) and Dugas (H). Heat inactivation of catalase from cod muscle and from some psychrophilic bacteria. *Journal of Food Science* 55(2); 1990; 581-582

Catalase from *Pseudomonas* sp. and *Micrococcus* sp. bacteria is inactivated at 93 and 73 C, resp., while cod muscle catalase is inactivated at 41 C. This implies that a suitable thermal treatment of a mixture of cod muscle and bacterial catalases will destroy only the cod catalase and leave the bacterial catalase unaltered. The activity of the remaining bacterial catalase is then measured using the disc flotation method. AS

- 1693 Sych (J), Lacroix (C), Adambounou (LT) and Castaigne (F). Cryoprotective effects of lactitol, palatinit and polydextrose on cod surimi proteins during frozen storage. *Journal of Food Science* 55(2); 1990; 356-360

The cryoprotective effects of lactitol dihydrate, polydextrose and palatinit (Isomalt) at 8% W/W in cod-surimi were compared to an industrial control containing a sucrose/sorbitol 1:1 mixture and a control without additive. Surimi was stored at -20 C for 12 wk and examined for freeze-

induced protein changes every 2 wk by salt extractable protein and differential scanning calorimetry analyses; Palatinit, lactitol and polydextrose stabilized surimi proteins equally well as did the sucrose/sorbitol mixture. Salt extractable protein and myosin peak enthalpy for surimi were maintained at the same level as the industrial control. Confirming earlier results, initial T_{max} myosin yielded information regarding surimi protein stability over extended periods of frozen storage. AS

Flounder

- 1694 Greene (DH) and Babbitt (JK). Control of muscle softening and protease-parasite interactions in arrowtooth flounder *Atheresthes stomias*. *Journal of Food Science* 55(2); 1990; 579-580

Distinct proteolytic activity was observed in the incubated muscle tissue of arrowtooth flounder. Absorbance measurements of the TCA filtrates indicated max. proteolytic activity between 55 C and 60 C, and min. activity below 40 C. Instron puncture tests of raw, baked, steamed, deep-fat fried and microwaved samples of arrowtooth demonstrated that rapid inactivation of the protease(s) by microwave cooking significantly improved textural properties. Myxosporean parasites tentatively classified as *Kudoa thyrsitis* were identified in all but one of the arrowtooth samples. However, no clear relationship between parasite density and textural deterioration of the cooked fillets was observed. AS

Hilsa toli

- 1695 Ramachandran (A), Rajendra Badonia) and Viswanathan Nair (PG). Effect of delayed icing on the microbiological quality of *Hilsa toli*. *Fishery Technology* 27(1); 1990; 30-35

Fish was subjected to following icing treatments: (i) uniced on board and iced immediately after landing, (ii) uniced on board and iced after a delay of 5 h, (iii) procured from landing centre and immediately iced. Fish iced in rigor condition (i) and (ii) showed a shelf-life of 11 days, but those procured from landing centre (iii) had only 8 days shelf-life. The low total bacterial count observed in all the samples increased only after spoilage. Coagulase positive staphylococci, fecal streptococci and *E. coli* were present only in (iii). From the results it is concluded that a delay of few h. in icing of *Hilsa* after catch that is, when the fish is still in rigor state may not considerably reduce its shelf-life, but a delay beyond rigor state will considerably reduce the shelf-life. KAR

Krill

- 1696 Kolakowski (E). Comparison of krill and Antarctic fish with regard to protein solubility. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 188(5); 1989; 419-425

Compared with Antarctic fish (*Notothenia rossi marmorata* and *N. gibberifrons*), Antarctic krill (*Euphausia superba* Dana) showed a higher content of proteins soluble in water or in low-ionic-strength ($I = 0.05$) phosphate buffer and a lower content of 0.86 M-NaCl-soluble proteins. The ratios between the contents of water-soluble proteins and 0.86 m-NaCl-soluble proteins were 1:3.4 in fish meat, 1:1.5 in krill meat, 1:1.3 in krill abdomen, 1:0.6 in whole krill, and 1:0.2 krill cephalothorax. In contrast to other fish water extracts of krill were found to contain considerable amounts of high-mol. mass (100 to over 350 KDa) proteins, suggesting a partial solution of krill myofibrillar proteins in water or in low-ionic strength ($I = 0.05$) buffers. A single stage extraction is recommended for the analysis of krill protein solubility. During the multi-stage extraction of krill tissues with water, a reduction in solubility of the 0.86 M-NaCl soluble myofibrillar proteins and their transfer into the 0.05 N-NaOH soluble fraction was observed as well as a partial enzymatic hydrolysis of proteins. AS

Salmon

- 1697 Sasaki (S), Ota (T) and Takagi (T). Composition of fatty acids in the lipids of masu salmon and pink salmon and canned pink salmon flesh. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(9); 1989; 1655-1660

The fatty acid comp. of the lipids in various organs from masu salmon and pink salmon, and in canned pink salmon flesh have been investigated using open-tubular GLC. All the samples showed at least 59 peaks of which 54 components were identified. The major fatty acids of these samples were 14:0, 16:0, 16:1 (n-7), 18:0, 18:1, (n-9), 18:1(n-7), 20:1 (1-11), 20:1 (n-9), 20:5 (n-3), 22:1 (n-11 and n-13), 22:1 (n-9), 22:5 (n-3) and 22:6 (n-3). The sum of these acids was more than 85% of the total acids in each sample. The major polyunsaturated fatty acids were 20:5 (n-3) (6.34-9.91% in masu salmon, 8.19-16.47% in pink salmon) and 22:6 (n-3) (9.98-18.44% in masu salmon, 4.88-8.56% in pink salmon). The polyunsaturated fatty acids having n-3 structure were concentrated more in the liver than in other organs. The canned pink salmon flesh C (Nippon Suisan Kaisha, Ltd) contained 22:1 (n-11 and n-13), ten times as much as the canned pink salmon flesh A (Taiyo Fishery Co. Ltd). SGB

- 1698 Skrede (G), Risvik (E), Huber (M), Enersen (G) and Blumlein (L). Developing a colour card for raw flesh of astaxanthin-fed salmon. *Journal of Food Science* 55(2); 1990; 361-363

Colour standards from the Natural Colour System (NCS) were selected by a sensory panel to match colour of raw flesh of astaxanthin-fed Atlantic salmon (*Salmo salar* L.). The NCS notations, blackness, chromaticity and hue, of the most frequently selected standards are given. A linear relationship between average NCS hue and NCS chromaticity values of each salmon was obtained, the hue being more reddish at high colour intensities. NCS chromaticity and hue were both significantly correlated with carotenoid concn. and with instrumentally obtained CIE (1979) a, b, and hue values. Procedures for the selection of NCS standards and for the practical use of a colour card in the evaluation of salmon colour, were developed. AS

Sardines

- 1699 Nonaka (M), Hirata (F), Sacki (H) and Sasamoto (Y). Manufacture of highly nutritional fish meat for foodstuff from sardines. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(9); 1989; 1575-1581 (Ja).

A new type of minced fish meat for foodstuff, HNFM-highly nutritional fish meat from sardine minced meat was developed. Fresh minced meat was ground in 4 vol. of cold sodium bicarbonate (0.1%) and NaCl (0.1%); bone and skin were removed; the ground meat was separated from water and lipids by centrifugation; the partially deodourised meat was then mixed with additives (5% sorbitol, 0.3% polyphosphate and 3% egg white). HNFM thus contained 60-80% less lipid and about 60% less volatile compounds than the quantities present in ordinary surimi and had a slight fish flavour. SGB

- 1700 Takiguchi (A). Effect of sodium chloride on the oxidation and hydrolysis of lipids in salted sardine fillets during storage. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(9); 1989; 1649-1654 (Ja).

Effects of NaCl on the oxidation and hydrolysis of lipids in salted sardine *Sardinops melanostictus* fillet, iwashi hirakiboshi, during storage were investigated. Salted sardine fillets with NaCl contents of 0.39, 2.83, 5.36 and 9.19% were prepared and stored at 5, -3, -20 and -35 °C. The degree of lipid oxidation of the samples was evaluated. When the peroxide value of the extracted lipid and the content of highly unsaturated fatty acid (HUFA) remained unchanged, the extent of lipid hydrolysis was measured by the acid value.

During salting and drying processes, carotenoid, and tocopherol contents in the lipids decreased with increase of NaCl content of the sample. At -3 C, -20, and -35 C, lipid oxidation in the samples with NaCl contents of 2.83, 5.36 and 9.19% commenced immediately after storage, while that of 0.39% began 5-30 days after storage, depending upon temp. The rates of lipid oxidation increased with increase of NaCl content. Lipid hydrolysis occurred during storage at 5, -3, and -20 Degree and the rates of hydrolysis depended upon the NaCl content and storage temp: the lower the NaCl content was, the faster hydrolysis proceeded. The hydrolysis may be attributed to endogenous enzyme system in sardine meat. In the samples stored at -35 C, little lipid hydrolysis occurred throughout the entire 180-day storage period, regardless of NaCl content of the sample. From these findings, it is clear that NaCl accelerates lipid oxidation and inhibits lipid hydrolysis in the salted sardine fillet during storage, though the degrees of accelerative and inhibitory effects of NaCl depend on the NaCl concn. and the storage temp. AS

Sea bream

- 1701 Morishita (T), Uno (K), Araki (T) and Takahashi (T). Comparison of the amounts of extractive nitrogenous constituents in the meats of cultured red sea bream of different localities and culture methods and those of wild fish. *Bulletin of the Japanese Society of Scientific Fisheries* (Nihon Suisan Gakkai-shi) 55(9); 1989; 1565-1573

Contents of various nitrogenous compounds in meat extracts of cultured red sea bream (*Chrysophrys major*) from different localities and those caught in the wild environment were measured and compared. The cultured fish had poorer content of many free amino acids and trimethylamine oxide, particularly taurine, lysine, alanine and glutamic acid, but were richer in histidine compared with the wild fish. Fish raised on moist pellets contained more threonine, proline, glycine, histidine, lysine and arginine compared with those raised on sardines. Fish cultivated in the mainfarm contained large amounts of taurine, glycine, alanine, threonine and proline in comparison with fish cultured in net cages and even with wild fish. SGB

Sting ray

- 1702 Lekshmy Nair (A) and Gopakumar (K). Utilization of *Trygon walga* (sting ray) from the Arabian sea. *Fishery Technology* 27(1); 1990; 48-50

Sting ray fish caught from the off-shore waters of Arabian sea was thawed, cleaned, filleted, cooked, dried and converted

into powder and the quality was determined. The fish powder has high protein (84.96%) and low fat (1.40%) content and free from pathogens. Its protein efficiency ratio was 2.8 which is higher than casein (2.6). The organ wt. and the liver and serum N levels of fish powder fed rats were almost similar to the casein fed groups. KAR

Tilapia

- 1703 Park (JW), Korhonen (RW) and Lanier (TC). Effects of rigor mortis on gel-forming properties of surimi and unwashed mince prepared from tilapia. *Journal of Food Science* 55(2); 1990; 353-355, 360

Quality of surimi and unwashed fish (tilapia, *Areochromis aureus*) mince was investigated as affected by development of rigor mortis in fish prior to processing. Significantly higher protein content and yield, reduced cook loss, and enhanced gel-forming ability and protein extractability were associated with surimi produced from pre-rigor fish. Gels prepared from unwashed minced muscle exhibited less cook-loss pre-rigor, but stage of rigor had little effect on gel rheological properties and protein extractability. Thermal rigidity scanning and differential scanning calorimetry showed substantially higher rigidity values and enthalpies of denaturation, resp., for surimi prepared from pre-rigor fish, but no effect on transition temp. due to stage of rigor. AS

Tuna

- 1704 David Kingston (S), Rajagopalasamy (CBT) and Sugumar (G). A comparative study on the quality characteristics of traditional masmin and mechanical kiln prepared masmin. *Fishery Technology* 27(1); 1990; 45-47

In Lakshadweep Islands (India) tuna is smoke cured (called masmin) by traditional method which is unhygienic. The quality of masmin smoked in the mechanical kiln for 2-3 h at 60 C was compared with the traditionally produced masmin. The moisture content in the mechanical kiln prepared smoked tuna was 10.18 plus or minus 0.28% against 6.20 plus or minus 0.14% for the traditional product which may be due to the double smoking followed in traditional method. Fat contents were same in both masmins, but ash content is high in the mechanical kiln prepared product. Total phenol content was 23.56 mg/100 g in mechanical kiln prepared product and 10.50 mg/100 g in traditional masmin. Bacterial counts did not show significant difference in the two products. Mechanical kiln processed product with its better appearance was found to be more acceptable. KAR

Yellow tail

- 1705 Murata (M) and Sakaguchi (M). The effects of phosphatase treatment of yellow tail muscle extracts and subsequent addition of IMP on flavour intensity. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(9); 1989; 1599-1603

The effects of phosphatase treatment of yellow tail (*Seriola quinqueradiata* muscle extracts and the subsequent addition of inosine 5'-monophosphate (IMP) were investigated to elucidate the role of IMP as flavourous constituent in fish. The acid phosphatase treatment of the white muscle extracts resulted in remarkable decline of flavour intensity (Umani body thickness, sourness, fresh fish flavour and overall taste quality). The added IMP restored the flavour intensity, depending on the concn. At $0.125 \mu\text{mol/ml}$ of IMP umami-intensity increased, and at $0.25 \mu\text{mol/ml}$ level umami together with body/thickness increased. $0.5 \mu\text{mol/ml}$ of IMP addition resulted in significant recovery of all flavour attributes. When $2 \mu\text{mol/ml}$ of IMP was added, the extract showed the max. flavour; further higher levels of IMP did not enhance the intensity any more. The addition of IMP to the dark muscle extract which has lost flavour by storage, caused a marked restoration of flavour, while the addition of glutamate (Glu) did not increase the flavour intensity. Addition of IMP or Glu to the white muscle extract which had full flavour, did not enhance the flavour any further. SGB

Products

Fish oils

- 1706 Saito (H) and Nakamura (K). An improvement of the NMR method for estimating the oxidative deterioration of fish oils. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(9); 1989; 1663

Pollack oil and sardine oil were allowed to stand in the dark at 40°C , and both the peroxide values (PV) and nuclear magnetic resonance (NMR) spectra were periodically measured to trace the relationship between each ratio of the olefinic protons to aliphatic protons (R_o) or of diallylmethylene protons to aliphatic protons (R_m) and PV for fish oil. Linear correlations were found both between R_o and PV and between R_m and PV. The results indicated that the change of the olefinic proton group occurring during the oxidative deterioration was directly related to the change of the diallylmethylene proton group. It was also concluded that the relationship between PV and the value of R_o/P (PUFA) generalised this modified NMR method to be applicable to fish oils of different sp. R_o and

Rm decrease continuously with time in contrast to PV, because they reflect directly the total amount of secondary products therefore NMR method can be used for detecting the oxidative deterioration of oils whose thiobarbituric acid value and PV have passed through a max. and are falling off. SGB

- 1707 Bubrata Basu. Use of tripolyphosphate in the development of products from minced fish meat. *Fishery Technology* 27(1); 1990; 36-39

Minced meat from Sciaenid was mixed with 0.2, 0.4, 0.7 and 1.0% sodium tripolyphosphate and kept for 1.5 h at room temp. Sodium tripolyphosphate was found to reduce the water activity and with the increase in the concn. of tripolyphosphate from 0.4 to 0.7% the water activity further decreased. The bacterial content of minced fish reduced from 1.1×10^4 to 2.0×10^3 with increase in tripolyphosphate concn. from 0.2 to 1.0%. Rehydration of the polyphosphate treated dried minced fish gave product with less toughness and good juiciness. Tripolyphosphate resists the thermal denaturation of actomyosin upto 45 C in fish cake. KAR

- 1708 Lizy Behanan, Saleena Mathew, Sudharma (D), Mukundan (MK) and Malika (V). Effect of corn oil on the quality and storage stability of pickled fish. *Fishery Technology* 27(1); 1990; 40-44

Pickle was prepared from *Epinephelus* spp. of fish after frying separately in refined gingili oil. Refined corn oil and processed using acetic acid and spices. During storage for 6 months organoleptic, chem. and microbiological observations were made at monthly intervals. Fish fried in corn oil and better colour, texture, odour and taste and was organoleptically superior to gingili oil fried fish pickle during the 6 months period of storage. Alpha-amino N and total volatile N were more in gingili oil fried pickles and it also showed higher free fatty acid content. Bacterial count was less in corn oil treated pickle during 6 months storage period. KAR

- 1709 Karahadian (C) and Lindsay (RC). Low temperature deodourization of fish oil with volatile acidic and basic steam sources. *Journal of the American Oil Chemist's Society* 67(2); 1990; 85-91

Menhaden, cod liver and siscowet lake trout oils were vacuum steam deodourized at 100 C to 210 C using volatile acid (acetic and hydrochloric) and base (ammonium hydroxide) solutions (0.005 N-0.25N) as steam sources. Volatiles in oils were analyzed by Tenax GC headspace analysis, and flavour and odour quality was evaluated. Deodourization of oils at 100 C

with acidic solutions yielded oils that lacked the burnt/fishy flavours compared to similar oils that were deodourized with either water or alkaline solutions. Acid catalyzed hydrations of fishy aldehydes by deodourizing acids and flavour masking by t,c-2-6-nonadienal appeared to cause the suppression of fishy flavours in fish oils deodourized by acid solutions. Oils deodourized at 210 C exhibited less intense fishy flavours, and lower concn. of fishy aldehydes, t,t,c-2,4,7-decatrinal, t,c,c-2,4,7-decatrinal, and c-4-heptenal. AS

PROTEIN FOODS

Nil

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Wines

- 1710 Edwards (CG) and Beelman (RB). Extraction and analysis of volatile compounds in white wines using amberlite XAD-2 resin and capillary gas chromatography. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 216-220

A rapid and simplified technique for the analysis of major volatile compounds in wines has been developed by modification of a previously published procedure for beer analysis. Modifications include adjustment of the alcohol content of standards and samples to 10% (v/v) ethanol, use of larger sample size, use of two internal standards, and employment of a newly developed capillary column with a modified poly (ethylene glycol) stationary phase. Relative recoveries of higher alcohols, esters, and medium-chain fatty acids extracted from a white wine ranged from 90 to 114%. Precision, as measured by coeff. of variation, were less than 5% with the exceptions of isobutyl alcohol (22%) and decanoic acid (9%). Analysis of white wines fermented with and without insoluble grape solids and/or yeast hosts revealed differences in the concn. of higher alcohols, esters, and medium chain fatty acids in the bottled wines. AS

Non-alcoholic beverages

Coffee

- 1711 Apostolopoulos (D) and Gilbert (SG). Water sorption of coffee

solubles by frontal inverse gas chromatography. Thermodynamic considerations. *Journal of Food Science* 55(2); 1990; 475-477, 487

Information on the sorption mechanism was obtained by investigating the thermodynamic relationships of moisture in freeze-dried coffee by frontal inverse gas chromatography. The thermodynamic parameters ΔG_s , ΔH_s and ΔS_s were calculated. The negative ΔG_s values obtained for water sorption of coffee under all conditions indicated the existence of strong hydrophilic sites in the coffee matrix. Also, the enthalpic and entropic changes showed a distinctive moisture content dependence which reflected a shift from surface sorption at restricted heterogeneous active sites to sorption at more homogeneous binding sites in the bulk phase and structural changes induced by swelling from multimolecular water that occupied the hydrophilic sites. AS

Fruit juices

- 1712 Chen (CS), Nguyen (TK) and Braddock (RJ). Relationship between freezing point depression and solute composition of fruit juice systems. *Journal of Food Science* 55(2); 1990; 566-567, 569

Freezing points of orange juices and model sugar-acid-water systems at various solute concn. were investigated using models of solution theory. The observed freezing point depression values of citrus juice were less than those of the model system of comparable average mol. wt. The differences were characterized by a parameter which accounted for the solute-solvent interactions. Models with generalized values were presented which allowed the prediction of equilibrium freezing curves of fruit juices based on proximate sugar acid comp. AS

- 1713 Khurdiya (DS). Carbonation in fruit beverages. *Beverage and Food World* 16(2); 1989; 9-11

Covers ingredient for carbonated beverages (water, sweeteners, acids, colourings, flavouring, carbon dioxide) and comp. of carbonated beverages (fruit based carbonated drinks scope and utilisation, fruits for beverages, preparation of fruit juices, carbonation, equipment and machinery and quality control. SRA

Apple juices

- 1714 Bartolini (ME) and Jen (JJ). Molecular characteristics of pectins from enzyme-treated apple juices. *Journal of Food Science* 55(2); 1990; 564-565

'Red Delicious' apple mashes treated by two commercial pectic enzymes were investigated by high performance size exclusion chromatography (HPSEC). Pectins isolated from the juice samples were fractionated into water-soluble, chelator-soluble, and alkali-soluble pectin fractions. Distinct pectin breakdowns were observed with HPSEC. Number average mol. wt. of pectin fractions were determined by intrinsic viscosity measurements. AS

- 1715 Zemel (GP), Sims (CA), Marshall (MR) and Balaban (M). Low pH inactivation of polyphenoloxidase in apple juice. *Journal of Food Science* 55(2); 1990; 562-563

Apple polyphenoloxidase (PPO) was inactivated to 98%, 63% and 34% of the initial activity after 20 min, at adjusted pH values of 2.00, 2.25 and 2.50 resp. Higher pH values resulted in slower inactivation. In a pilot plant study, juice was acidified with HCl to pH 2.00 for 45 min and subsequently raised to the original pH with NaOH. PPO activity decreased by 88% and filtration of the juice was improved. Sensory analysis of the juice indicated that the acidified samples had a lighter but less preferred colour and a disagreeable salty taste. No aroma difference was recognized. AS

Blackcurrant juices

- 1716 Taylor (J). Colour stability of blackcurrant (*Ribes nigrum*) juice. *Journal of the Science of Food and Agriculture* 49(4); 1989; 487-491

Forty blackcurrant (*Ribes nigrum* L) genotypes, including cv Baldwin and cv Ben Lomond as standards, were assessed for juice processing qualities. Regression analyses showed to no significant variation in the rate of loss of total pigments but significant variation in the rate of loss of individual major pigments. Genotypes with a high delphinidin to cyanidine ratio showed no greater colour stability than genotypes with low ratios, which indicated that the differences between the stability than genotypes with low ratios, which indicated that the difference between the stability of the major pigments was not great enough to exert a stabilising effect on the total pigment concn. The variation in total pigment concn. appeared to be the main factor contributing to the greater stability of cv Ben Lomond juice colour compared with cv Baldwin juice colour. AS

Buckthornberry juices

- 1717 Dongowski (G), Bock (W) and Bruckner (J). Study on the stabilization of unfermented buckthornberry juice. *Die Nahrung*

33(7); 1989; 631-640

Numerous polysaccharide hydrocolloids are studied with respect to their ability to stabilize unfermented buckthornberry juice (sussmost). Only pectins with high mol. wt. and high degree of esterification showed good stabilization effect. In this connection it was stated that such reactions as partial depolymerisation, de-esterification and amidation of pectin preparation which take place under certain technological conditions also in pectin production processes result in the decrease of the stabilizing effect of pectin. Only the transesterification of pectin with ethanol to ethylpectins could possibly have a positive effect on the stabilization of the juice samples. Surprisingly, the further tested lipidic emulsifiers, protein hydrocolloids, and combinations of these substances do not act as stabilizers of the juice samples. AS

Grape juices

- 1718 Feners (PJ). A review of limonin in grapefruit (*Citrus paradisi*) juice, its relationship to flavour and efforts to reduce it. *Journal of the Science of Food and Agriculture* 49(4); 1989; 389-404

This review covers brief history of limonin in citrus juices and its detn., taste threshold levels, regulatory aspects for limonin in grapefruit juice, limonin content of grapefruit juice, effect of several factors on limonin content of grapefruit juice, effect of limonin in grapefruit juice on sensory flavour quality, interaction between brix:acid ratio and limonin content in affecting sensory flavour of grape fruit juice and methods for reducing the limonin content of grapefruit juice. 42 references. SRA

- 1719 Manlan (M), Matthews (RF), Rouseff (RL), Littell (RC), Marshall (MR), Moye (HA) and Teixeira (AA). Evaluation of the properties of polystyrene divinylbenzene adsorbents for debittering grapefruit juice. *Journal of Food Science* 55(2); 1990; 440-445, 449

Various physical properties of polystyrene divinylbenzene absorbents involved in the removal of the bitter compounds naringin and limonin from grapefruit juice were investigated in a series of batch reaction processes. The removal of naringin from model systems and, naringin and limonin from grapefruit juice increased with the degree of crosslinkage and surface area of the adsorbents which had a solid density higher than 1.2 g/mL (dry) to ensure complete submersion. The specific surface area appeared to be the major factor in the debittering process. Regeneration with 95% ethanol was found

to be more efficient than warm water. Sensory evaluation tests showed that more than 65% of the panelists preferred the less bitter treated juice over the control. AS

- 1720 Splittstoesser (DF) and Stoyla (BO). Effect of various inhibitors on the growth of lactic acid bacteria in a model grape juice system. *Journal of Food Protection* 52(4); 1989; 240-243

Various compounds were tested to determine whether they would substitute for sulphur dioxide as inhibitors of strains of *Leuconostoc oenos* when inoculated into a model fruit beverage containing 5 C Brix Concord grape and 0.1% yeast extract. The following additives and their maximal concn. exhibited varying degrees of inhibitory activity fumaric acid, 1.5 mg/ml; sorbic acid, 300 u g/ml; decanoic acid 20 u g/ml. 100 IU/ml; and carbon dioxide 2.8 vol. Effectiveness of the inhibitors was enhanced by the presence of 8 to 10% ethanol, and was inversely related to the size of the inoculum. AS

- 1721 Takagi (K), Toyoda (M), Saito (Y), Niwa (M) and Morimoto (H). Composition of fermented grape juice continuously produced by immobilized *Lactobacillus casei*. *Journal of Food Science* 55(2); 1990; 455-457, 469

Continuous fermentation of grape juice was carried out in a packed bed column system using *Lactobacillus casei* absorbed onto ceramic beads. Chemical components in the reaction vessel of this system were compared with those of a free-cell fermentation. No major differences were noted in the principal components. Diacetyl and methionine levels decreased, however, whereas aspartic acid and cysteine increased. Silica levels increased immediately after initiation of the immobilized cell culture due to elution from the ceramic carrier beads. In two of the five trials the reactor was contaminated with *Bacillus megaterium*. AS

Mango juices

- 1722 Beerh (OP), Lulkarni (SG), Berry (SK), Kalra (CL), Sehgal (Rc) and Kour (S). Suitability of some mango varieties available in Punjab for ready to serve beverage. *Beverage and Food World* 16(2); 1989; 28-30

Five var. of mangoes, viz., 'Totapuri', 'Dusehri', 'Chausa', 'Langra' and 'Fazli' were studied for their ready-to-serve (RTS) beverage quality: physico-chemical parameters of the fruits, pulp and RTS beverages prepared therefrom were determined before and after processing and during storage at room temp. for 12 months. The pulp yield was max. (67.6%) in 'Langra' and min. (58.6%) in 'Chausa'. 'Langra' mangoes also

showed max. total soluble solids (20.5%) and 'Fazli' the min. (13.5%). The pulp of 'Dusehri' mangoes had the best desired orange yellow colour. The carotenoid content was max. (5.4 mg/100g) in 'Dusehri' and min. (1.7 mg/100g) in 'Chausa'. The beverage made from 'Dusehri' pulp was ranked number one with respect to colour, aroma and taste and that prepared from a blend of 'Dusehri' and 'Totapuri' (1:4) as second followed by 'Totapuri' and blend of 'Dusehri' and 'Fazli'. AS

Orange juices

- 1723 Sattar (A), Durrani (MJ), Khan (RN) and Hussani (B). Effect of packaging materials and fluorescent light on HTST-Pasteurized orange drink. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 188(5); 1989; 430-433

HTST-pasteurized orange drink packed in clear, green and amber glass bottles and coextruded wax laminated paper (TetraPak), was exposed to fluorescent, light of 50-60 ft-C for 32 days at ambient room temp. Chemical analysis revealed significant effect of packages and light on different quality parameters during storage ($P < 0.05$). Ascorbic acid losses amounted 60.6%, 54.6%, 51.0%, and 45.5% in clear glass, green glass, TetraPak, and amber glass resp. against 42.4% in the unexposed control during 32 days storage. Titratable acidity, Brix, Brix-acid ratio, light transmission and could-settling generally showed an increasing pattern with advanced storage. Brown glass gave the best protection followed by TetraPak, green glass and clear glass. Evaluation of the drink for sensory components indicated a congruent pattern of changes in the ratings which correlated with the packaging materials tested. AS

FATS AND OILS

- 1724 Ologunde (MO), Ayorinde (FO) and Shepard (RL). Chemical evaluation of defatted *Vernonia galamensis* meal. *Journal of the American Oil Chemist's Society* 67(2); 1990; 92-95

Chemical comp. of defatted meal of *Vernonia galamensis* and the lipid comp. of residual oil are reported. MNK

- 1725 Walde (P). A colorimetric determination of fatty acids as a new assay of lipases of reverse micelles. *Journal of the American Oil Chemist's Society* 67(2); 1990; 110-115

A spectrophotometric method is described for the detn. of the free fatty acid content in triglyceride oils or other lipophilic samples using phenol red as fatty acid indicator.

MNK

Fats

- 1726 Oxilgen (S) and Ozilgen (M). Kinetic model of lipid oxidation in foods. *Journal of Food Science* 55(2); 1990; 498-501, 536

A general mathematical model in the same form with the logistic equation simulated lipid oxidation in food systems. Almost perfect agreement was found between the model and seventeen sets of data from the literature, obtained with egg yolk, restructured beef and pork nuggets, cooked pork meat, iced gutted dogfish, frozen mackerel fillets and ground raw poultry meat. A simple method was described for the evaluation of the numerical values of the model parameters. Variations of these numerical values were also associated with varying pretreatment and storage conditions. AS

Oils

Palm oils

- 1727 Okpala (KO) and Nwoke (MN). The palm oil bleaching capacity of various Nigerian clay deposits. *International Journal of Food Science and Technology* 24(6); 1989; 647-651

Soybean oils

- 1728 Wu (C-H) and Liou (S-E). Effect of water content on volatile compounds derived from soybean oil in cans. *Journal of the American Oil Chemist's Society* 67(2); 1990; 96-100

Soybean oil-water cans with different soybean oil water ratios were prepared and stored. The volatiles and peroxide values (POV) values of these samples were monitored. Water in cans caused the production of larger amounts of volatiles just after sterilization, however, during the storage period, cans without water had a higher rate of production of volatile compounds. It was postulated that POV values do not reflect the changes of volatile compounds in cans. AS

SPICES AND CONDIMENTS

Spices

Ginger

- 1729 Spiro (M) and Kandiah (M). Extraction of ginger rhizome. Kinetic studies with acetone. *International Journal of Food*

Science and Technology 24(6); 1989; 589-600

Ground sieved Jamaican ginger rhizome has been treated with acetone under various conditions and, in each case, the concn. of (6)-gingerol extracted was measured as a function of time. The results could be expressed by two intersecting first-order plots and an initial intercept, representing very rapid initial extraction, followed by a fast stage and a subsequent slow stage. At 30 °C the rate constant of the slow stage was c. 95 times smaller than that of the fast stage and its activation energy was 3.6 times larger. The fast stage was not affected by solvent flow into the ginger particles, or by an increase in the stirring speed. These findings, together with the fact that both first order rate constants were inversely proportional to the square of the radius of the particles, pointed to (6)-gingerol diffusion through the solid ginger as the rate-determining step. The data could also be fitted by equation of So and MacDonald (1986). The relevance of the research to the industrial production of ginger oleoresin is pointed out. AS

Saffron

- 1730 Alonso (GL), Varon (R), Gomez (R), Navarro (F) and Salinas (MR). Auto-oxidation in saffron at 40 °C and 75% relative humidity. *Journal of Food Science* 55(2); 1990; 595-596

The colouring power and bitterness of ground saffron stored at 40 °C with relative air humidity of 75% were investigated. The loss of colour followed first order kinetics and the loss of bitterness followed second order kinetics. AS

Tamarind kernel powder

- 1731 Prabhanjan (H). Studies on modified tamarind kernel powder. Part I. Preparation and physicochemical properties of sodium salt of carboxy methyl derivatives. *Starch/Starke* 41(11); 1989; 409-414

Sodium salt of O-carboxymethyl derivatives of tamarind kernel powder (TKP), at different levels of substitution, was prepared in isopropanol medium. The derivatives were characterised by degree of substitution (DS), intrinsic viscosity and elution profile (GPC). Alkaline solutions, purified by alcohol precipitation showed higher intrinsic viscosity due to an alkali soluble fraction. Solution properties of the derivatives as a function of DS were found to be affected both by the substituent groups as well as by the alkali used for derivatization. Swelling power, solubility and tolerance to organic solvents of the

derivatives increased with increasing carboxymethylation. The interaction properties of TKP with CaCl and sodium tetraborate were found to be reversed upon carboxymethylation. AS

SENSORY EVALUATION

- 1732 Aishima (T). Recent advances in flavour research using chemometrics. *Acta Alimentaria* 18(2); 1989; 225-243

Chemometric methodologies, especially multivariate analysis, are playing an ever increasing role in correlating sensory evaluation to instrumental data. Sensory evaluation and instrumental analysis using GC, HPLC, GC-MS and GC-FTIR clearly demonstrated the intrinsic multidimensionality of flavour. The application of multivariate analysis to analyzing flavour data is categorized; correlating instrumental measurements to sensory evaluation, sample discrimination, extraction of information from data matrix and sample clustering. Successful results obtained from multivariate analysis have been contributing to establish objective evaluation of flavour quality. Simplex method is the most widely used optimization algorithm in chemometrics. The conditions to produce the most desirable strawberry juice flavour was easily be found by simplex optimization in a multivariate parameter system. Recent trends in flavour research are reviewed by especially focusing on the utilization of chemometrics. AS

- 1733 Durst. (GL) and Laperle (EA). Styrene monomer migration as monitored by purge and trap gas chromatography and sensory analysis for polystyrene containers. *Journal of Food Science* 55(2); 1990; 522-524

A plastic-like off-flavour in food packaged in multilayered polystyrene containers was determined to be predominately caused by residual styrene monomer, in conjunction with ethylbenzene, that had diffused into the food product. Purge and trap gas chromatography was used to measure $\mu\text{g/L}$ (p.p.b.) concn. of styrene monomer than migrated from containers over time. The flavour panel used in this study was able to detect the presence of styrene in apple juice at a concn. of $50 \mu\text{g/L}$. A mixture of styrene and ethylbenzene was found to lower the concn. at which an off-flavour could be detected to $25 \mu\text{g/L}$. Deionized water stored in containers at various temp. was analyzed for styrene and ethylbenzene by purge and trap gas chromatography, and the initial data fitted a simple diffusion model showing that styrene pickup was proportional to the square root of time. AS

- 1734 Margaret Cliff and Noble (AC). Time-intensity evaluation of sweetness and fruitiness and their interaction in a model solution. *Journal of Food Science* 55(2); 1990; 450-454

Sweetness and fruitiness were evaluated by time-intensity (TI) procedures in solutions varying in concn. of glucose and peach essence at two temp. Of the eleven TI parameters quantified to characterize the TI curves, ten parameters varied significantly across samples for sweetness, whereas only seven varied significantly for fruitiness. Max. sweetness intensity increased as glucose or peach essence concn. or solution temp. was raised. In contrast, max. fruitiness intensity increased only with an increase in peach flavour concn. Although the total persistence of aftertaste did not differ significantly between the two attributes, the mean time to max. intensity for sweetness (6.6 sec) was 3.8 sec shorter than that found for fruitiness. AS

- 1735 Sadana (B), Hira (C) and Kang (H). Sensory evaluation of chapathis prepared from different levels of infested wheat flour. *Beverage and Food World* 16(2); 1989; 19-20

The present study is conducted to evaluate the cooking quality and organoleptic evaluation of chapathis prepared from 0, 5, 10, 15 and 20% infested wheat flour. Increased rate of infestation decreased the chapathi making quality. Chapathi prepared from 20% infested wheat flour were not acceptable due to poor appearance, texture and unpleasant aroma. SRA

FOOD STORAGE

Nil

INFESTATION CONTROL AND PESTICIDES

Pesticides

- 1736 Appaiah (KM), Sreenivasa (MAA) and Nagaraja (KV). Insecticide residues in crops and foods in India-a review on organophosphorous insecticides (1980-87). *Indian Food Packer* 44(2); 1990; 11-17

The organophosphorus insecticides are becoming popular because of their low persistence in the environment and greater efficiency in controlling crop pests. This review consolidates the scattered information on the bioefficacy and

persistence of the new insecticides under Indian environment in crops like cabbage, cauliflower, peas, okra, brinjal, cowpea, coriander, sweet orange, bitter gourd, chilli, potato, pigeon pea, onion, mustard, peach, cotton, and others. Also covers decontamination, monitoring and storage study. VKR

- 1737 Mohammad (FK), Al-Kassim (NA) and Abdul-Latif (AR). Effect of diphenhydramine on organophosphorus insecticide toxicity in mice. *Toxicology* 58(1); 1989; 91-95

Male mice were treated orally with the organophosphorus insecticides fenamiphos and dichlorvos at 10 and 150 mg/kg, resp. The insecticides produced signs of toxicosis characteristic of cholinesterase inhibition, and induced death in all treated mice. Pretreatment of mice with diphenhydramine HCl (20 and 30 mg/kg, subcutaneously) 15 min before either insecticide significantly ($P < 0.05$) reduced the incidence of toxic manifestations (excessive salivation, Straub tail, and whole body tremor), delayed the onset of death, and increased the percentage of survivors. Doses of diphenhydramine < 20 mg/kg were not so effective. The data indicated a protective property of diphenhydramine against organophosphorus insecticide-induced toxicosis. AS

- 1738 Mohan (S), Devadass (CT), Jayaraj (S) and Mohanasundaram (M). Biogas fumigation to control pulse beetle *Callosobruchus chinensis*. *Bulletin of Grain Technology* 27(3); 1989; 196-198

Biogas was tested as a fumigant against pulse beetle, *Callosobruchus chinensis* by exposing the eggs, grubs and adults for 1-7 days. Fumigation for 5 days resulted in complete mortality of eggs, grubs and adults of pulse beetle. Cooking qualities of the fumigated grain did not show any variation. SRA

- 1739 Saroj Jain and Yadav (TD). Development of resistance to deltamethrin in laboratory strain of pulse beetle, *Callosobruchus chinensis* (Linn). *Bulletin of Grain Technology* 27(3); 1989; 199-203

Development of resistance in lab. strains of *Callosobruchus chinensis* (Linn) by continuous use of deltamethrin was tested. The first progeny was designated as parental susceptible strain. One part of parental stock was continuously reared without subjecting to any insecticidal pressure, whereas another portion was selected by treatment with deltamethrin in each generation (deltamethrin-resistant strain). Freshly emerged adults of the parental strain were exposed for 24 h to green gram seeds treated with deltamethrin at a dose causing about 50% kill (0.16 and 0.18 p.p.m.). Surviving adults were reared for the next generation (F_2)

and this process was repeated upto 7 generations. Insects developed 3.45 fold resistance to deltamethrin at a dosage of 0.18 p.p.m. in the 7th generation. SRA

- 1740 Shiv Shankar), Yadav (AS), Ashok Kumar , Srivastava (JL) and Sone Lal). Efficacy of methacrifos against stored grain insect pests in commercial grain warehouse. *Bulletin of Grain Technology* 27(2); 1989; 148-150

Field trails were conducted in wheat godown (Meerut, India) with methacrifos 500 EC and malathion 50% EC against stored grain insect pests. Both the pesticides were sprayed separately at the dose of 0.15 g a.i./m² stacks wheat. Walls, floors, alleyways of godown were also sprayed with these insecticides. Results have shown that mortality in crawling insects (*Tribolium castaneum* (Herbst) and *Rhizopertha dominica* (Fab.) were 60-100% with methacrifos and 50-80% with malathion upto 30 days of spray. Mortality of insects present in grain bags ranged from 50-60 and 40-50% with methacrifos and malathion, resp. SRA

- 1741 Son Lal, Doharey (RB), Goyal (RK) and Singh (DV). Efficiency and residual toxicity of deltamethrin flow 25 as compared to malathion 50 per cent EC against stored grain insect pests in commercial warehouses. *Bulletin of Grain Technology* 27(2); 1989; 79-84

Studies were conducted in Food Corporation of India godowns at Sandila (Hardoi district) and Khurja (Bulandshahar district) of India. Of the 8 wheat stacks; 4 stacks and their surroundings were treated with deltamethrin flow 25, and the other four stacks and their surroundings were treated with malathion 50% EC. Prior to insecticide application grain bags, walls, floors and alleways of godowns, half of the stacks (i.e. 2) under treatment with each insecticide were fumigated with aluminium phosphide (ALF) at a dose of 2 tables per t, while remaining 2 stacks were treated with the insecticide without fumigation. Deltamethrin was applied at 30 mg a.i./m² and malathion at 150 mg. a.i./m². Insect population per square meter area of walls, floors, alleyways and outer surfaces of grain bags as also in 500 g samples drawn from different places in stacks was recorded before spraying the insecticides and at an intervals of 3, 7, 15, 30, 45, 60, 75, 90, 105, 120, 135, and 150 days after the treatment. The residual malathion was estimated by spectrophotometric method, and deltamethrin by GLC method using electron capture detector (ECD) in Shimadzu gas chromatograph. Result indicates that deltamethrin flow was more effective than malathion against *Sitophilus oryzae* and *Oryzaephilus surinamensis* as compared to *Rhizopertha dominica* and *Tribolium castaneum* upto 135 days and 120 days after

treatment of ALP fumigated stacks, resp. In the ALP untreated stacks deltamethrin flow could protect the stacks, upto 90 days after treatment. Malathion lost its efficacy in 30 and 15 days after treatment in fumigated and unfumigated stacks resp. SRA

Rodenticides

- 1742 Saxena (Y). Effect of sublethal doses of warfarin and vacor on reproduction of *Rattus rattus rufescens*. *Bulletin of Grain Technology* 27(3); 1989; 188-191

Mature and healthy rats of both sexes wt. 140-160 g were treated with sublethal doses of warfarin (1.75 mg/kg) and vacor (25 mg/kg) for 4 days. The gestation period, total number of litters, av. wt. of litters, sex ratio, still births, neonatal deaths and total % of mortality were recorded. It was observed that both the rodenticides at sublethal doses reduced the fecundity significantly. The av. gestation period was also reduced when both the parent rats were treated, the % number of still births and neonatal deaths were increased. General symptoms were noticed in the treated rats, including loss of appetite, frequent passing of faecal matter and paralysis of hind and fore limbs. On the basis of these findings, it was emphasised to consider not only the toxic hazards of poisoning but the sublethal doses may inflict serious physiological disorders. SRA

- 1743 Singh (Y), Singh (KN), Seehra (BS) and Sone Lal. Evaluation of silmurin (steroid glucoside) a single dose rodenticide in laboratory and village of Udaipur, Rajasthan. *Bulletin of Grain Technology* 27(2); 1989; 204-207

Acceptability and effectiveness of silmurin (6 beta-(acetyloxy)-3 b (Beta-D-glucophyhranosyloxy)-8, 14 dihydroxy-bufa-4, 20 22-trienolide) bait for house rat control was used. Silmurin (1.0% technical powder) was mixed to get 0.05% concn. of silmurin in mixture. The observation on bait acceptability revealed that both male and female rats showed good response towards silmurin poison baiting. The data on mortality showed that male and female rats required 5.0 and 7.0 mg/kg body wt. active ingredient resp. SRA

BIOCHEMISTRY AND NUTRITION

- 1744 Elmadfa (I) and Schwalbe (P). Some aspects of alpha-tocopherol bioavailability. *FAT Science Technology* 91(10); 1989; 402-407 (De).

The bioavailability of alpha-tocopherol depends on various factors. The ingested esterified form is almost completely hydrolysed in intestinal tract. Bile and pancreatic juice are necessary for optimal hydrolysis. Polyunsaturated long chain fatty acids in the diet inhibit whereas medium-chain triglycerides enhance the absorption. Hence the consumption of long chain polyunsaturated oil should be supplemented with alpha-tocopherol. The bioavailability of intravenous administered MU alpha-tocopheryl acetate is good. MNK

- 1745 Engelhardt (R) and Gregory (JFIII). Adequacy of enzymatic deconjugation in quantification of folate in foods. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 154-158

A critical aspect of many assay methods for folate in foods and other biological materials is the enzymatic deconjugation of polyglutamyl forms of the vitamin. This research was conducted to evaluate the properties of pteroylpolyglutamate hydrolase (conjugase) from hog kidney and the efficacy of this enzyme when used to deconjugate sample extracts for folate analysis. Extracts of a var. of foods caused detectable inhibition of the enzyme, although appropriate combinations of incubation time and enzyme concn. yield complete or nearly complete hydrolysis of synthetic polyglutamyl folates. These results support the efficacy of the enzyme from hog kidney and indicate that need for care in establishing proper conditions for deconjugation in folate assays. AS

- 1746 Imafidon (GI) and Sosulski (FW). Nucleic acid nitrogen of animal and plant foods. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 118-120

Meat products contained greater concn. of nucleic acid N (NAN) (0.35-0.56 mg/g) than dairy and egg products (0.05-0.15 mg/g) but, relative to product N, the comp. were < 0.5%. The intermediate levels of NAN in cereals and field pea (0.22-0.51 mg/g) represented 1.4-2.5% of total N. Leafy vegetables, roots, tuber, and fruits contained (0.20-0.73 mg/g of NAN, which constituted 1.3-9.6% of total N. A highly significant correlation ($r = -0.63^{**}$) between NAN content (mg/g of N) and product N concn. should aid in prescription of dietary limits on intake of purines and in calculation of N to protein conversion factors. AS

- 1747 Imafidon (GI) and Sosulski (FW). Nonprotein nitrogen contents of animal and plant foods. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 114-118

Nonprotein N (NPN) was extracted from 20 primary food products and purified by constant vol. ultrafiltration (10000

MW cutoff) before separation and quantification of free and acid-hydrolyzable amino acids (AA) and their amides. Animal, fish, and poultry products contained 0-35 mg, cereal and pulse grains had 12-44 mg, and roots, vegetables, and fruits contained 65-240 mg of NPN/g of N. Free AA constituted one-third and half of total hydrolyzable AA in the animal and plant food, resp., and 70-90% of NPN was composed of non amino acid nitrogen. Glu/Gln and Asp/Asn were prominent in most free AA and peptide fractions, and Lys was a major AA in the free AA pool. AS

- 1748 King (J), De Pablo (S) and Montes de Oca (F). Nonheme iron evaluation of a hemoglobin iron concentrate. *Journal of Food Science* 55(2); 1990; 593-594

The nonheme iron concn. of a hemoglobin iron conc. (HIC) was investigated and the effect of temp., time and rate of heating on the formation of nonheme iron of HIC and in fresh Red Blood Cells (RBC) was evaluated. Nonheme iron of HIC was 20% of total iron and did not increase with slow or fast heating. Nonheme iron concn. from RBC increased from 3.4% to 10.2% after slow-heating and to 6.9% after fast-heating ($P < 0.05$). HIC heated at 150 and 300 C significantly increased nonheme iron ($P < 0.05$). Based on the observed increase after heating at 150 and 300 C, heat processing of HIC will decrease nutritional availability of iron from this products. AS

- 1749 Mekhael (KG), Bassily (NS), Mekhael (NA) and Said (AK). Response of adult rats to lysine supplementation. *Die Nahrung* 33(7); 1989; 625-630

The response of adult rats to wheat flour protein fortified by addition of lysine was studied by utilizing the relative protein value (RPV) compared to non-fortified wheat flour. Lactalbumin was used as a standard protein. Fortification of wheat flour by 0.3% lysine resulted in better growth of rats when fed at 6% protein level. However, no significant difference was observed in the growth of rats fed non-fortified or fortified wheat flour at 4% or 2% protein level. The relative nutritive value (RNV) of supplemented wheat flour protein is higher than that of the non-supplemented when change in body wt. or change in body water are used as response parameters. When the dietary protein is provided at maintenance or below maintenance levels, lysine is not limiting. Therefore, supplementation of wheat flour protein with lysine did not result in any better growth response. When protein is provided at levels above maintenance requirements lysine is limiting and better growth was achieved by lysine supplementation to wheat flour protein. AS

- 1750 Merei (AR), Laszlofi (M), Zaykas (G), Vertes (L), Gergely (A), Antal (M) and Biro (G). Vitamin A and E of institutionalized elderlies. *Die Nahrung* 33(7); 1989; 695-697

- 1751 Prakash (D), Jain (RK) and Misra (PS). Amino acid profiles of some under-utilized seeds. *Qualitas Plantarum - Plants Foods for Human Nutrition* 38(3); 1988; 235-241

Twenty-three seeds of different botanical families growing in India were analysed for their protein content and amino acid comp. They showed a wide variation in their total protein (8.0 to 42.7%). Some of them were comparable and some were even better than popular food legumes such as kidney bean and chickpea in protein levels and amino acid comp. AS

- 1752 Rutherford (SM) and Moughan (PJ). Guanidination of lysine in selected dietary proteins. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 209-211

Lysine in proteins can be converted to homoarginine by the guanidination reaction with O-methylisourea (MIU). Food proteins in which all the lysine has been converted to homoarginine can be used in nutrition studies to directly determine endogenous lysine excretion from the gut. The pH of the reaction solution is known to affect the completeness of conversion of lysine to homoarginine. Optimum pHs of 11.0, 10.7, and 10.8 were found for sodium caseinate, gelatin, and soy isolate protein, resp., when 2% (w/v) of each protein in 0.6 M MIU was incubated at 20 C for 144 h. As the protein concn. in 0.6 M MIU was increased above 2% (w/v), the extent of conversion declined markedly for sodium caseinate and the soy isolate but there was only a very small decline for gelatin. With gelatin, a max. conversion of lysine to homoarginine of 95% was achieved, indicating that guanidinated gelatin is a suitable protein source for directly determining the endogenous excretion of lysine in the mammalian gut. AS

- 1753 Wachnik (A), Biro (G), Gaal (O) and Antal (M). Dietary influence of the hepatic lipid peroxidation in two strains of rats. *Die Nahrung* 33(7); 1989; 687-689

Nutrition

- 1754 Chaudhary (VK) and Weber (FE). Dietary fiber ingredients obtained by processing brewer's dried grain. *Journal of Food Science* 55(2); 1990; 551, 553

Brewer's dried grain (BDG) was ground and separated into a coarse and fine flour suitable for increasing total dietary fiber and protein content of formulated foods. Process

conditions were established to obtain yields of 40% fine (protein rich) flour and 60% coarse (fiber rich) flour. These had protein contents of 39.0% and 21.5% and total dietary fiber of 35.5% and 70.0%, resp. Both flours were free of starch and sugar and contained less than 0.1% phytic acid as a result of the brewing process. AS

- 1755 Sirisinha (S). Interrelationship between parasitic infections and nutritional status. *ASEAN Food Journal* 4(4); 1989; 131-137

This article reviews interaction between malnutrition and infection, effect of parasitic infections on nutritional status, effect of nutritional status on parasitic infections, nutritional modulation of immune responses to parasitic infections (immune responses to parasites, effect of malnutrition on immunological degrees). 27 references. SRA

TOXICOLOGY

- 1756 Bleyl (DWR). Factors influencing nutrio-toxic effects. *Die Nahrung* 33(7); 1989; 641-681 (De).

The basis of the requirements for nutrio-toxicological model investigation is the results of many yrs of international experience. They are, however, limited for pragmatic reasons to standardized one-dimensional test conditions and can only be partially compared with the variable exposure conditions of man. Therefore, we have tried to review the practical significance of factors influencing nutrio-toxic effects. It has been shown that due to physiological and genetic differences, different lifestyle, biogeochemical and nutritional factors, additional occupational exposure as well as spontaneous diseases individual sensitivity shows a great variation range in man and lab. animals. The multiple exposure which is common practice makes it difficult to provide proven evidence. The safety factor used for the extrapolation of results obtained in animal exp. as compared with man is a suitable pragmatic safety measure, but in the case of 1:100 as to the order of magnitude it is not always in accordance with the range of response to xenobiotics in a human population. This fact raises the necessity of searching for so-called "risk groups" in the population. Additionally, the possible acceleration of spontaneous diseases by exposure to xenobiotics has to be taken into consideration. AS

Aflatoxins

- 1757 Cotty (PJ) and Lee (LS). Aflatoxin contamination of

cottonseed. Comparison of pink bollworm damaged and undamaged bolls. *Tropical Science* 29(4); 1989; 273-277

- 1758 Ogunsanwo (BM), Faboya (OO), Idowu (OR), Ikoptun (T) and Akane (DA). The fate of aflatoxins during the production of ogiri a West African fermented melon seed condiment from artificially contaminated, seeds. *Die Nahrung* 33(10); 1989; 983-988

Twenty-six market samples and four lab.-prepared samples of Ogiri were screened for aflatoxin contamination. Aflatoxins were not detected in any of the samples. The fermented products (ogiri) was prepared with *Aspergillus flavus* contaminated melon seeds. Losses of 64.7% aflatoxin B1 and 82.9% aflatoxin G1 were observed at the end of the third day of fermentation of the ground melon seeds. The samples were completely detoxified at the fourth day of fermentation.
AS

FOOD LAWS AND REGULATIONS

Nil

GENERAL

- 1759 Potier (S), Pascat (B) and Benoualid (K). Increase of the shelf-life of an intermediate moisture food with modified or controlled atmospheres. *Sciences Des Aliments* 9(4); 1989; 701-712 (Fr).

This work is concerned with the increase of the shelf-life of an intermediate moisture food with modified or controlled atm. The choosen model is a sponge cake with a water activity of 0.85. The first exp. with controlled atm. confirmed that the mix (50%/carbon dioxide 50% nitrogen less than 1 % oxygen, 85% RH) produce an inhibiting effect on moulds and maintains the food texture during six months. The other exp. with modified atm. showed that the max. quantity of oxygen must always stay under 10 mg/50 moulds inside the package. Otherwise these moulds grow before six months. This study ends with the elaboration of a table of chem. properties of the cake packaging which ensured a preservation for six months. AS

- 1760 Rajendra Babu (V). Manpower planning for future development. *Indian Dairyman* 42(4); 1990; 175-178

The various steps in manpower planning with the associated problems and practices are described. Covers the impact of the organisation, existing social order and value system, a perspective and corporate strategy. SRA

FOOD PROCESSING

- 1761 Akterian (S), Videv (K) and Das (H). Sensitivity of sterilization effect from process parameters. *Journal of Food Science and Technology (India)* 27(1); 1990; 45-59

Sensitivity of sterilization effect (SSE) define changes in F-effect by relative changing of respective determining parameter. Analytical and correlative dependence of SSE which have a bearing on convectionally heated canned foods are presented. Generalized intervals of changing SSE, involved in definite multitude from sterilization regimes are given. SSE is calculated on the basis of worked out private programmed products. Way of defining of the complete relative changing of F-effect, caused by simultaneously relative changing of all defined parameters, is also shown. AS

Extrusion

- 1762 Hsieh (F), Mulvaney (SJ), Huff (HE), Lue (S) and Brent (JJr). Effect of dietary fiber and screw speed on some extrusion processing and product variables. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 204-207

Yellow corn meals were extruded with wheat and oat fibers using an APV Baker MPF50/25 twin screw extruder. Increasing the screw speed from 200 to 300 rpm, decreased percent torque, increased specific energy and decreased die pressure. The extrudates had increased axial expansion but decreased radial expansion, increased bulk density and breaking force. Adding either wheat fiber (up to 30%) or oat fiber (up to 20%) to corn meals had no appreciable effects on percent torque, specific energy and die pressure. Increasing fiber content in corn meals increased the axial expansion but decreased the radial expansion. The net results were increases in the bulk density and breaking force for the extrudates. AS

FOOD PACKAGING

- 1763 Iwaki (M). Computer imaging package design stimulation. *Packaging India* 22(4); 1989; 30-35

Computer imaging application of computer graphics design, computerisation of the designing process, creativity, package design simulation, D-CAD application example, the future of package design stimulation are explained. SRA

- 1764 Overgaww (CJ). Export packaging of tropical fruits for the European market. *Packaging India* 22(4); 1989; 18-19

- 1765 Popko (H), Popko (R) and Komsta (H). The investigation of the influence of basic parameters on energy consumption of homogenization process. *Acta Alimentaria Polonica* 14(2); 1988; 165-174

As a result of many yrs studies it has been proved that apart from temp., pressure, homogenized medium type, etc. the construction of the homogenizing valve is one of the principal parameters influencing the energy consumption of the homogenization process. Moreover, there have been presented the results of the study on the influence of homogenization pressure on the properties and the microstructure of the protein phase of dairy products. The conclusion that can be drawn is that homogenization at high pressure is not advisable for two reasons: high energy consumption of the process and lowered properties of the products. AS

FOOD ENGINEERING AND EQUIPMENT

- 1766 Halden (K), De Alwis (AAP) and Fryer (PJ). Changes in the electrical conductivity of foods during ohmic heating. *International Journal of Food Science and Technology* 25(1); 1990; 9-25

This paper reports exp. to determine the changes in electrical conductivity which occur during conventional heating of some common foods. A number of effects which occur during conventional heating, such as starch transition, melting of fats and cell structure changes are shown to affect the electrical conductivity. In some cases the presence of an electric field induces enhanced diffusion of cell fluids in the food which increases the rate of changes of conductivity with temp. above that found by conventional heating. Preheating is found to increase the electrical conductivity of some foods, making them acceptable for ohmic processing. BV

Engineering

- 1767 Aguerre (RJ), Suarez (C) and Viollaz (PE). New BET type multilayer sorption isotherms. Part I. Theoretical derivation of the model. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 188-191

Based on the hypothesis that the heat of sorption for the second and higher absorbed layers increase, decrease or remain constant, taking as limit the heat of evaporation-condensation, a group of BET-type multilayer isotherms has been derived. In the first and second cases it was found that the isotherms derived predict that the amount adsorbed for a given water activity, is respectively lower or higher than that corresponding to BET equation. Both isotherms showed infinite sorption at $X = 1$ as BET equation. It was also demonstrated that when the heat of sorption is assumed constant for all adsorbed layers above the first, the isotherm obtained is the GAB equation. AS

- 1768 Aguerre (RJ), Suarez (C) and Viollaz (PE). New BET type multilayer sorption isotherm. Part II. Modelling water sorption in foods. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 192-195

Two equations derived from a modification of BET theory were evaluated for goodness of fit over 74 experimental food isotherms representing spices, fruits, vegetables, meats, proteins, starchy foods and milk products. About 77% of the

isotherms represented principally by starchy foods, proteins, meats and spices obeyed to Eqn (1). Such isotherms when compared to BET equation showed lower sorption capacity than BET at high water activity. On the contrary, 23% of the products formed principally by high-sugar foods, i.e., fruits and some vegetables, whose sorption capacity resulted much higher than BET isotherm for water activities above 0.45 were adequately correlated by Eqn (2). AS

- 1769 Awonorin (SO) and Lamb (J). The Leidenfrost phenomenon. Experimental investigation of the vapourization of nitrogen droplets on a food surface. *Journal of Food Science* 55(3); 1990; 808-816

The vapourization of liquid nitrogen droplets at rest on a gelatin slab of food material was investigated in relation to heat transfer in food freezing. Measurements were made of changes in droplet sizes during evaporation using a photographic technique while varying the slab surface temp. from +10 C to -120 C at atm. pressure. The measured values of the vapourization time were about 12% higher than those theoretically predicted, and about 15% lower for droplets contaminated with moisture. AS

- 1770 Kim (CM) and Pratt (DE). Degradation products of 2-tert-butylhydroquinone at frying temperature. *Journal of Food Science* 55(3); 1990; 847-850, 853

Decomposed products of 2-tert-butylhydroquinone (TBHQ) at frying temp. in model system were identified and characterized. An attempt was made to determine the functions of the decomposed compounds in foods using model system. Tert-butylbenzoquinone (TBBQ) was identified as the primary and major oxidation products of TBHQ. Interconversion between TBHQ and TBBQ was the most important role in antioxidant effectiveness and carry-through effect of TBHQ. Several types of dimers by ether linkage resulting from thermolysis at frying temp. were identified. In addition, significant reactivity of a phenolic antioxidant with the functional carboxyl group of a fatty acid, which might lower antioxidant effectiveness, was determined using a simple model system. AS

- 1771 Roy (I), Campanella (OH), Normand (MD) and Peleg (M). Uniaxial compression of double layers of solid foods. *Journal of Texture Studies* 20(4); 1989; 443-455

The compressive force deformation relationships of various foods, that included breads, cheeses and sausages, were described by a two parameters power model. To predict the behaviour of double layered arrays of some foods, their model parameters were incorporated into an equation that describes

the relationships between the force and the total deformation of the array for a given cross sectional area and any initial thickness of each of the two layers. Construction of the force-deformation relationships of the double layered array was done by numerical solution of this equation for various levels of deformation. The force deformation relationships predicted in this way were found to be in good agreement with experimental relationships. This was irrespective of whether the force deformation curve of the components had a concave upward or downward shape. AS

- 1772 Sadeghi (F) and Swartzel (KR). Generating kinetic data for use in design and evaluation of high temperature food processing systems. *Journal of Food Science* 55(3); 1990; 851-853

The kinetics of sucrose (pH 2.5), Blue 2 (pH 11.3) and Blue 2 (pH 9.5) were determined for high food processing temp. A traditional batch kinetic data generation and a novel continuous flow method were examined. The novel method consisted of a tubular flow reactor designed to establish the time-temp. equivalent points for any process. Activation energy values determined for the continuous method were 46.0, 27.2 and 52.3 KJ/mol for sucrose, Blue 2 (pH 11.3) and Blue 2 (pH 9.5), resp. Values utilizing the traditional batch (capillary tube) generation method yielded 94.6, 58.2 and 74.5 KJ/mol, resp. Based on these results, a new thermal evaluation technique is proposed for describing difficult to define continuous flow systems. AS

- 1773 Shi (V), Liang (B) and Hartel (RW). Crystallization kinetics of alpha-lactose monohydrate in a continuous cooling crystallizer. *Journal of Food Science* 55(3); 1990; 817-820

The crystallization of alpha-lactose monohydrate in a continuous cooling crystallizer was investigated at various temp. and supersaturation. The population balance model was used to analyze the product crystal size distribution as determined by the Coulter Multi Sizer for each condition studied. Nucleation and growth values were thereby determined for each temp. and supersaturation. Kinetic models were then developed for both nucleation and growth to demonstrate the effects of the operating parameters. The results showed that the nucleation process had a temp. dependence with an activation energy of 17.0 Kcal/mol and that nucleation increased with the 1.9 power of supersaturation and the 1.0 power of the suspension density (mass of crystals). The growth process was found to have a temp. dependence with an activation energy 22.1 Kcal/mol and to be a second order function of the supersaturation. AS

Equipments

- 1774 Burgaud (I), Dickinson (E) and Nelson (PV). An improved high pressure homogenizer for making fine emulsions on a small scale. *International Journal of Food Science and Technology* 25(1); 1990; 39-46

In this paper a new improved type of miniature high-pressure homogenizer which includes separate chambers for oil and aqueous phases avoids the necessity for premixing prior to homogenization. This homogenizer is for small scale production of emulsions with highly reproducible droplet-size distribution. To illustrate the performance characteristics of the jet homogenizer, data are presented for the effect of homogenization pressure and equipment dimensions on the droplet size of n-tetradecane-in-water emulsions stabilized by sodium caseinate. BV

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

- 1775 Kwon (J-H), Belanger (JMR), Sigouin (M), Lantheir (J), Willemot (C) and Jocelyn Pare (JR). Chemical constituents of *Panax ginseng* exposed to Gamma irradiation. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 830-834

Chem. constituents were monitored to assess the biochemical and nutritional safety of *Panax ginseng* powders that were irradiated at doses of 1-10 kGy. Quantitative analysis has shown that the main effective components saponins are not altered by irradiation. Ginsenoside Rg₁ was not affected by the treatment. Negligible changes were observed in the free carbohydrate contents. Doses of more than 5 kGy caused significant decreases in sulphur containing amino acids and in tyrosine. At doses of 10 kGy, free amino acids, such as proline and lysine, showed an appreciable increase. The comp. in minerals was not altered irrespective of the applied doses. AS

- 1776 Pinter-Szakacs (M) and Molnar-Perl (I). Determination of tryptophan in unhydrolyzed food and feedstuffs by the acid ninhydrin method. *Journal of Agricultural and Food Chemistry*

38(3); 1990; 720-726

The optimum conditions for direct measurement of tryptophan in soybean meals, wheat, maize, barley, rye, sunflower, fish, and meat meals have been reported. The acid ninhydrin solution has been reacted directly with the protein matrix without any previous isolation or dissolution of the protein. Reproducibility and recovery studies showed that 10-100 μg of tryptophan-containing protein can be determined with a standard error of 2.7% or less. The decreases of tryptophan content of treated soybeans are essentially a function of the parameters applied. The remaining tryptophan contents, expressed in the percentages of the untreated one, were as follows; 81% HCl + phosphoric acid (pH 1.8), neutralized; 79% HCl + phosphoric acid (pH 2.0), neutralized; 67% HCl + phosphoric acid (pH 2.0) without neutralization; 63% microwave 5 min, 100 $^{\circ}\text{C}$; 57% HCl (pH 2.0), without neutralization. AS

- 1777 Schuchmann (H), Roy (I) and Peleg (M). Empirical models for moisture sorption isotherms at very high water activities. *Journal of Food Science* 55(3); 1990; 759-762

Published moisture sorption data of selected gums, fibers and starch determined at water activities of up to 0.98-0.99 were fitted by an empirical three parameters model. It has the general mathematical structure of the GAB model but its abscissa's range was expanded from zero to one, to zero to infinity. This was done by substitution in $[1/(1-\text{water activity})]$ or $\text{water activity}/(1-\text{water activity})$ for water activity terms that could be derived from Henderson's and Oswin's models. This hybrid model with either substitution had a particularly good fit to the isotherms part that accounted for moisture sorption at high water activities. The model with the logarithmic transformation, however, appeared to be more practical and to better account for the intermediate part of the moisture sorption isotherm. AS

- 1778 Tzeng (WC) and Zall (RR). Polymers decrease cleaning time of an ultrafiltration membrane fouled with pectin. *Journal of Food Science* 55(3); 1990; 873-874

An ultrafiltration system fouled by pectin solutions was used as a model system. The fouled membrane flux was fully restored by circulating 0.5% NaOH solution for 1 h. By adding 0.003% polyethylene oxide in 0.5% NaOH solution, the cleaning time required to fully recover flux of the fouled membrane was reduced to 2 min. The mechanism of improving cleaning efficiency may not be wholly attributed to the scouring effect of the polymer on the membrane surface. The cleaning and rinsing results suggest that polymers in cleaning solutions convert the pectin foulant into a foulant-polymer complex which

could be readily rinsed from the membrane surface by water. AS

Chemistry (Analytical)

- 1779 Babu (S) and Indushekhar Shelonikar. Method for distinguishing food colours from textile colours. *ISI Bulletin* 3(11); 1990; 438-439

A quick and simple paper chromatographic method which could be carried out at household and field levels has been developed to distinguish textile colours from food colours. The test needs only blotting paper, a glass tumbler and water as the developing solvent. The principle of faster movement of synthetic food colours has been made use of in this paper chromatographic method. KAR

- 1780 Cantoni (C), Fabbris (F) and Rogledi (S). GC determination of chloramphenicol in some foods. *Industrie Alimentari* 28(272); 1989; 592-594 (It).

This paper reports on optimised procedure for assay of chloramphenicol (CAF) in milk, egg, and muscles tissues. Recoveries on CAF from meat was 87 plus or minus 5%, from milk 95 plus or minus 5% and from egg 88 plus or minus 5%. BV

- 1781 Sharma (GK) and Arya (SS). Effect of spices, additives and autoxidised oils on analysis of sorbic acid in foods. *Journal of Food Science and Technology (India)* 27(1); 1990; 50-51

Effect of spices antioxidant and other additives on the recovery of sorbic acid by the use of spectrophotometric and colorimetric method has been compared. Except fumaric acid and its derivatives and cumene oleoresin, the other spices and additives and oxidised fats do not interfere in the analysis of sorbic acid. AS

FOOD MICROBIOLOGY AND HYGIENE

Enzymes

- 1782 Kadrekar (SN) and Ramasarma (GB). Amylase and protease production by *Bacillus subtilis*. Studies on improvement of strain and medium. *Journal of Food Science and Technology (India)* 27(1); 1990; 4-6

Resting cells of a local strain of *Bacillus subtilis* were subjected to repeated treatment with the mutagenic agents, N-methyl-N'-nitro N-nitrosoguanidine (NTG), with a view to developing improved strains for production of alpha-amylase

and protease. A simplified agar-plate procedure was developed for screening the mutants. An improved strain, NTG-121, was isolated it produced on liquid culture medium under stationary conditions 17.7 FIP units of amylase activity and 0.66 FIP units of protease activity per ml of broth compared to 10.61 and 0.36 units resp. produced by the parent strain. Further treatment of growing cultures of mutant NTG-121 with the same mutagenic agent resulted in mutants producing more of protease (1.57 units per ml) but less of amylase (14.7 units per ml). Addition of corn-steep liquor, mineral salts mixture (Ca, Mn, Zn, phosphate), starch and casein to the liquid culture medium in which strain NTG-121 was grown, increased the production of amylase and protease to 24.7 and 2.67 FIP units resp. per ml of broth. AS

- 1783 Ramesh (MV) and Lonsane (BK). Effect of metal salts and protein modifying agents on activity of, thermostable alpha-amylase produced by *Bacillus licheniformis* M27 under solid state fermentation. *Chemie Mikrobiologie Technologie der Lebensmittel* 12(5); 1990; 129-136

The activity of thermostable pure alpha-amylase, produced by *Bacillus licheniformis* M27 under solid state fermentation, was stimulated by Ca upto 3 p.p.m. level but the effect was temp. dependent at high concn. Other eight metal salts evaluated were able to inhibit the enzyme by 13-100% depending on metal salt employed and its concn. EDTA at 10 mM concn. inhibited the enzyme completely and it was possible to partly overcome this effect by incubation with calcium chloride. The enzyme was completely stable to the action of p-hydroxy mercuri benzoic acid and urea. Comparison of these characteristics with the enzyme from other strains of *B. licheniformis* and *B. sp.* revealed that the judicious selection of appropriate enzyme preparation is essential for successful hydrolysis of impure starches/starchy materials. No information on these aspects on bacterial alpha-amylase produced under solid state fermentation technique was available earlier. AS

Papain

- 1784 Sanogo (T), Paquet (D), Aubert (F) and Linden (G). Proteolysis of alphas₁ casein by papain in a complex environment. Influence of ionic strength on the reaction products. *Journal of Food Science* 55(3); 1990; 796-800

The influence of NaCl on bovine alphas₁ casein (alpha-S₁-CN) hydrolysis by papain (EC 3.4.22.2) was studied at pH 6.5 and 40 °C. The electrophoretic analysis in presence of sodium dodecyl sulphate (SDS), showed that alphas₁-CN was sequentially hydrolyzed as the reaction time increased. The analysis by isoelectric focusing electrophoresis showed that after 1 min,

the resulting peptides had their isoelectric point (pI) assessed between 4 and 9. With the increase of NaCl concn., two peptides of apparent pI near pH 5 and 8.5 were progressively liberated. The chromatographic analysis by reverse phase HPLC showed that a major peak, observed after 1 min of reaction, persisted in the hydrolysates obtained in the presence of salt at all reaction times. It was concluded by the peptidic sequence detn. that the hydrophobic C-terminal region of alpha-CN was not hydrolyzed in the presence of NaCl.
AS

- 1785 Sanogo (T), Paquet (D) and Linden (G). Proteolysis of α casein by papain in a complex environment. Influence of ionic strength of the kinetic constants. *Journal of Food Science* 55(3); 1990; 801-804, 816

The influence of α casein concn. on the hydrolytic activity of papain was studied. High substrate concn. was inhibitory. In presence of NaCl, the papain affinity for α casein increased (the apparent Michaelis constant (K_{mv} app.) decreased from $9.4 \cdot 10^{-5}$ to $5.6 \cdot 10^{-5}$ M) and was lower for 0.08 M NaCl. The max. velocity (v_{max} app.) was independent from NaCl concn. below 0.34 M but decreased above. The enzyme-substrate affinity was increased by the addition of urea, but the v_{max} app. decreased. The inhibitory effects of excess substrate was more important with the presence of both urea and NaCl. Acetylation of α casein showed that K_{m} app. ($21.2 \cdot 10^{-5}$ M) was independent of salt concn., while the v_{max} app. varied, and the substrate inhibitory activity was suppressed.
AS

Fermented foods

- 1786 Soni (K) and Sandhu (DK). Fermentation of idli. Effect of changes in raw materials and physico-chemical conditions. *Journal of Cereal Science* 10(3); 1989; 227-238

Idli is a popular traditional South Indian steamed pancake prepared from a fermented batter containing both rice (*Oryza sativa*) and black gram (*Phaseolus mungo*). Analysis of 35 different samples of idli batters, both commercial and lab.-prepared, revealed the occurrence of bacteria belonging to six sp. in the range of 10^6 - 10^9 g; 68% of the samples were also positive for yeasts, ranging up to 10^6 g and yielding six types. Lab. studies on ways to improve the nutritional and organoleptic properties of idli identified changes in fermentation conditions that led to appreciable increase in the microbial cell counts, total acids, vol. soluble solids, reducing sugars, non-protein nitrogen, free amino acids,

amylases, proteinases and water soluble vitamins, including B1, B2, B12 and C. Novel Idli batters, prepared by replacing the conventional black gram with other legumes, revealed comparable changes but with different in the levels of some biochemical constituents. Incubation of Idli batters at 28 C with initial pH around 4.5 and supplemented with sucrose (1-2%) proved to be favourable for improving the nutritional constituents and organoleptic characteristics. AS

Microorganisms

Algae

- 1787 Heiba (H1). Fatty acid composition of eleven algae from coastal zones of Qatar. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 401-405

The fatty acid comp. of 11 algae sp. from coastal zones of Qatar is reported. Compositional variations between the different sp. were examined for potential nutritional and biological significance. The major fatty acids identified were palmitic (16:0), myristic (14:0), oleic (18:1), eicosadienoic (20:2), linoleic (18:2), stearic (18:0) and hexadecaenoic (16:1). The fatty acids were characterized by the relatively high abundance of polyunsaturated acids, while the C18 unsaturated acids were appreciably more abundant than the C20 unsaturated acids. SRA

Bacteria

Lactobacillus acidophilus

- 1788 Faruk Bozoglu (T) and Candan Gurakan (G). Freeze-drying injury of *Lactobacillus acidophilus*. *Journal of Food Protection* 52(4); 1989; 259-260

Lactobacillus acidophilus ATCC 4355 cells were more stable to freezing at -20 C after supplementation of the growth medium with 0.1% calcium carbonate. However, added Ca did not affect viability and injury during lyophilization. Inclusion of 5% glycerol in the suspending medium before freeze-drying resulted in superior survival and decreased injury during the drying process. AS

Salmonella typhimurium

- 1789 Airoidi (AA) and Zottola (Ea). The survival of *Salmonella typhimurium* in propylene glycol water mixtures. *Journal of Food Protection* 52(4); 1989; 256-258

The effect of propylene glycol, a coolant used in dairy

processing plants, on the growth and survival of *Salmonella typhimurium* was studied. Cultures were inoculated into 0.1% reconstituted non-fat dry milk with glycol concn. ranging from 0 to 50% (water activity 0.99-0.83) and were incubated at 37 °C or -1 °C. Serial dilutions were plated on tryptic soy agar (Difco), incubated at 37 °C for 24 h and enumerated. At 37 °C, 5% or more glycol inhibited the growth of *S. typhimurium*. At concn. > 20% glycol, water activity < 0.96. No recovery was possible after 4 h at 37 °C. At 1 °C a slow decline in population was seen regardless of glycol concn. The higher the concn. the faster the rate of decline in population. Aeration of the system resulted in a more rapid decrease in the number of *S. typhimurium* than the static system. AS

Staphylococcus aureus

- 1790 Halpin-Dohnalek (MI) and Marth (EH). *Staphylococcus aureus* production of extracellular compounds and behaviour in foods. A review. *Journal of Food Protection* 52(4); 1989; 267-282

Growth of *Staphylococcus aureus* is accompanied by production of such extracellular compounds as hemolysine, nuclease, coagulase, lipase, and enterotoxins. Enterotoxins that can cause food poisoning are produced by about one-third of the coagulase positive strains of *S. aureus*. The enterotoxins are a heterogeneous group of heat-stable, water-soluble, single-chain globular proteins having a mol. wt. between 28,000 and 35,000 daltons. Production of enterotoxin by appropriate strains of *S. aureus* is affected by the nutritional quality and pH of the substrate, temp., atm., NaCl (and hence water activity), other chemicals, and competing microorganisms. Outbreaks of staphylococcal food poisoning most often are associated with processed red meats, poultry products (especially chicken salad), sauces, dairy products (especially cheeses), and custard- or cream-filled bakery products. Ham and associated products often are involved in as many as 30% of outbreaks of staphylococcal food poisoning. Most outbreak result from the combined effects of contamination of the food, often through unsanitary handling, with *S. aureus* and holding the food at the wrong temp. thus allowing growth and synthesis of enterotoxin by the pathogen. AS

- 1791 Tuncan (EU) and Martin (SE). Combined effects of salts and temperature on the thermal destruction of *Staphylococcus aureus* MF-31. *Journal of Food Science* 55(3); 1990; 833-836

The combined effects of salts (NaCl and KCl) and heat treatment temp. on the thermal destruction of *Staphylococcus aureus* MF-31 was studied by determining the relationships between the decimal reduction time (D value), temp. and each of three parameters (water activity, osmotic pressure and water

binding energy) of the heating menstruum. The results demonstrated that the resistance of *S. aureus* MF-31 to heat destruction increased as the degree of salt-water association increased. Salts and heat treatment temp. had an interactive effect on heat resistance; however, increasing the heat treatment temp. made the difference caused by salt concn. become insignificant. AS

Fungi

Mushrooms

- 1792 Andrawis (A) and Kahn (V). Ability of various chemicals to reduce copper and to inactivate mushroom tyrosinase. *Journal of Food Biochemistry* 14(2); 1990; 103-115

Treatment of mushroom tyrosinase with reducing agents such as hydrogen peroxide, ascorbic acid, phenylhydrazine, gallic acid, ferrocyanide and hydroxylamine resulted in inactivation of the enzyme. Under the conditions tested, 50% inactivation of the enzyme was obtained with 4 MUM hydrogen peroxide, 20 MUM ascorbic acid, 40MUM phenylhydrazine, 6 mM gallic acid, 12 mM ferrocyanide and 22 mM hydroxylamine. The ability of the reducing agents to reduce Cu^{2+} in a chem. model system was determined and it was found that gallic acid, phenylhydrazine, ascorbic acid and hydroxylamine are relatively good reductants of Cu^{2+} while hydrogen peroxide and ferrocyanide are relatively poor ones. The Cu content of mushroom tyrosinase before and after inactivation by each of the reducing agents was determined. The Cu content of the enzyme inactivated by hydrogen peroxide, hydroxylamine, phenylhydrazine, ferrocyanide, gallic acid and ascorbic acid was 100%, 90%, 90%, 85%, 85% and 76% compared to that of the control (enzyme not treated). AS

- 1793 Rajarathnam (S), Bano (Z), Berger (RG) and Drawert (F). Effect of amendment of the growth substrate on the flavour composition of fruit bodies of *Pleurotus flabellatus*. *Chemie Mikrobiologie Technologie der Lebensmittel* 12(5); 1990; 145-150

The fresh fruit bodies of *Pleurotus flabellatus* grown on rice straw with and without supplementation by cottonseed powder were studied for their flavour constituents by GC and coupled GC-MS. Both samples were found to differ mainly in the relative concn. of the flavour components. Sixteen flavour components were quantified in each of the samples and their odour characterised by sniffing analysis. The major constituents were 2-pentanone, 2-pentanone, butanoic acid methylester, and 2-methyl-3-pentanone. AS

Yeasts

Saccharomyces cerevisiae

- 1794 Cerrutti (P), Alzamora (SM) and Chirife (J). A multi-parameter approach to control the growth of *Saccharomyces cerevisiae* in laboratory media. *Journal of Food Science* 5(3); 1990; 837-840

The effects of combination of reduced water activity (water activity from 0.97 to 0.93), pH (3, 4, 5 and 6) and addition of potassium sorbate (0, 100, 500, and 1,000 p.p.m.) on the growth of one strain of *Saccharomyces cerevisiae* in lab. medium were studied. The minimal water activity for growth inhibition in the absence of sorbate and in the range of optimal pH was 0.89. Various combinations of water activity, pH and sorbate concn. prevented growth of the yeast at water activity values above 0.89. For examples, at water activity = 0.93, addition of 100 p.p.m. sorbate at pH = 4.0 resulted in inhibition at water activity = 0.97 and same pH (4.0), 500 p.p.m. of sorbate were necessary. The combined effects of the above parameters on generation time, max. population, and lag time of the cells were also determined. AS

Hygiene

- 1795 Gala (S), Spotti (E), Mutti (P) and Campanini (M). Resistance of mould spores to disinfectants. *Industria Conserve* 64(2); 1989; 126-129 (It).

Moulds spores of gas-forming strains isolated from aseptically packaged acid foods were evaluated for sensitivity to an iodophor (Iosan) and to a product based on hydrogen peroxide and peracetic acid, in two different formulations (P3 Oxonia Active and P3 Oxonia Active Extra). The sensitivity of the spores varied as a function of the sp. The two *Acremonium roseogriseum* strains were readily inactivated by the lowest concn. tested (0.1-0.3% Iosan and 0.4-0.5% P3 Oxonia Active), while the *Mucor javanicus* spores proved particularly resistant: 5 decimal reduction were obtained after 30 sec. of contact with 3% Iosan, 3.6% P3 Oxonia Active Extra or 5.2% Oxonia Active. The strains of *Rhizopus oryzae* and *Mucor spinescens* showed intermediate resistance. The inactivating action of the disinfectants on the spores treated in the dried state was remarkable for all strains, inactivation (> 5 decimal reduction) was observed after 30 sec. of treatment with concn. of 0.5% or lower. AS

Bacteria

Listeria

- 1796 Shelef (LA). Listeriosis and its transmission by food. **Progress in Food and Nutrition Science** 13(3/4); 1989; 363-382

This review summarizes current knowledge on the properties, occurrence in foods and virulence of *Listeria monocytogenes*, and to assess implications of the human risk factor on food production. Occurrence and characteristics of the bacterium, virulence and disease symptoms, transmission to humans, incidence and behaviour in foods, and means of controlling growth in foods are reviewed. 122 references. SRA

Listeria monocytogenes

- 1797 El-Shenawy (MA) and Marth (EH). Inhibition or inactivation of *Listeria monocytogenes* by sodium benzoate together with some organic acids. **Journal of Food Protection** 52(11); 1989; 771-776

Tests were done to determine the fate of *Listeria monocytogenes* at 13 or 35 C in Tryptose Broth (TB) with and without the pH adjusted to 5.6 or 5.0 using acetic, tartaric, lactic, or citric acid and containing 0.00, 0.05, 0.15, or 0.3% sodium benzoate. The bacterium grew in all controls (free of benzoate) under all conditions except only slight growth was detected at 13 C when the pH was adjusted to 5.0 using acetic or tartaric acid. When TB was acidified with acetic or tartaric acid and incubated at 35 C the bacterium was inactivated or inhibited under all conditions except growth occurred at pH 5.6 with 0.05 or 0.15% sodium benzoate and at pH 5.0 with 0.05% benzoate. Incubation at 13 C with the same acids in TB was accompanied by inactivation or inhibition of the bacterium at all test conditions except in the presence of 0.05% sodium benzoate and pH 5.6 obtained by added acetic acid, and in the presence of 0.05 or 0.15% benzoate when tartaric acid was used to adjust the pH to 5.6. Acidifying TB with lactic or citric acid and incubating at 35 C resulted in growth at pH 5.0 and 5.6 regardless of concn. of benzoate except 0.3% which caused inhibition or inactivation at pH 5.6 or 5.0 resp. Incubation at 13 C with the same acids in TB resulted in inactivation or inhibition of *L. monocytogenes*, except growth occurred at pH 5.6 when the medium contained 0.05 or 0.15% benzoate. Slight growth was observed in the presence of 0.05% benzoate at pH 5.0 when the medium was acidified by lactic or acetic acid. AS

Yersinia enterocolitica

- 1798 Kounev (Z). Effects of enrichment medium and incubation temp.

on recovery of *Yersinia enterocolitica* from cooked sausage. *Journal of Food Protection* 52(11); 1989; 818-820

Enrichment media and incubation temp. were studied for the recovery of *Yersinia enterocolitica* from cooked sausage. The best enrichment condition for this purpose was phosphate buffered saline, pH 7.6, incubated at 25 C for 24-48 h. Incubation at 4 C appeared to present an additional stress factor and more nutritive media interfered with the isolation of *Y. enterocolitica* from cooked sausage. AS

BIOTECHNOLOGY

1799 Kahlon (SS), Kalra (KL) and Grewal (HS). Fungal single cell protein. Current status. *Indian Journal of Microbiology* 30(1); 1990; 13-28

In this review the authors deal with aspects like merits and demerits of single cell protein (SCP) as compared to plant protein; raw materials which could be used for SCP production; current status of fungal SCP production under submerged and solid substrate fermentation; world situation of SCP research; processes available for fungal SCP production; and the future prospects for SCP. 135 references. KAR

Single cell proteins

1800 Murado (MA), Siso (MIG), Gonzalez (MP), Franco (JM) and Miron (J). SCP from mussel processing wastes. II. Use of microfungi. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 209-220 (Es).

The growth of five microfungal sp. in mussel steam-opening effluents (rich in glycogen and previously submitted to a treatment of acidification to pH = 4.5 and decantation of the mainly peptidic precipitate formed) was studied to attain their depuration through SCP production. Three general growth models have been found: 1, without significant glycogen degradation (*Aspergillus wentii*); 2, glycogenolysis with low reducing sugars surplus (*Fusarium semitectum*) and 3, glycogenolysis with high reducing sugars surplus (*Aspergillus niger*, *A. oryzae*, *A. awamori*). Sp. from groups 2 and 3 can be cultured in half vol. concentrated media, with slightly lesser efficiency and yield. Chemical Oxygen Demand (COD) in postincubated media of these sp. falls 74-85% with respect to the pretreated medium. *F. semitectum* gives the best yield and the highest protein content. AS

TISSUE CULTURE

Nil

FOOD ADDITIVES

- 1801 Gencer (G). Effect of selected additives on the flow parameters of 1:1 mixtures of carrageenan guar and CMC locust bean gum. *Journal of Texture Studies* 20(4); 1989; 473-478

Flow parameters of 1:1 mixtures of carrageenan-guar and CMC-locust bean gum in the presence of common food ingredients, namely, sugar, salt and proteins, were determined by using a coaxial viscometer. The effect of additives on yield stress, and power law model constants varied depending on the type of ingredient and its concn., and the nature of the gum. Although, it is interesting to see the flow behaviour of gum blends together with additives in concn. that are common in food products, it is necessary to study an enormous number of combinations in order to analyze a multicomponent system quantitatively. AS

Antioxidants

- 1802 Herrmann (K). Significance of hydroxycinnamic acid compounds in food. I. Antioxidant activity-Effects on the use, digestibility, and microbial spoilage of food. *Chemie Mikrobiologie Technologie der Lebensmittel* 12(5); 1990; 137-144

Hydroxycinnamic acid compounds universally distributed in plants have numerous effects on food. The antioxidant activity and effects on the use and digestibility of food, and on microbial food spoilage are reviewed in this article. BV

Stabilizers

Gums

- 1803 Burgaud (I) and Dickinson (E). Emulsifying effects of food macromolecules in presence of ethanol. *Journal of Food Science* 55(3); 1990; 875-876

The influence of droplet size of ethanol present during homogenization was investigated for emulsions stabilized by macromolecular emulsifiers: sodium caseinate, whey protein isolate, gelatin and gum arabic. Emulsions produced with polysaccharide gum arabic had increasing droplet size as ethanol concn. increased, in contrast to the protein-stabilized

emulsions which had decreasing droplet size (up to 20% ethanol for gelatin and 30% ethanol for the milk proteins), followed by increasing droplet size with increasing ethanol concn. Interfacial tension measurements indicated that the emulsifying property of the macromolecules depended on adsorption at the oil-water/alcohol interface during emulsification. AS

Galactomannans

- 1804 Baird (JK) and Smith (WW). A simple colorimetric method for the specific analysis of food grade galactomannans. *Food Hydrocolloids* 3(5); 1989; 413-416

A specific and sensitive colorimetric method for the detn. of galactomannans has been developed based upon the specific oxidation of galactose using galactose oxidase enzyme. The assay is useful for the specific identification food-grade galactomannans, guar and locust bean gum (LBG) in polysaccharide blends and isolates from food formulation. AS

CEREALS

- 1805 Bargman (TJ), Hanners (GD), Becker (R), Saunders (RM) and Rupnow (JH). Compositional and nutritional evaluation of eastern gamagrass (*Tripsacum dactyloides* (L.), a perennial relative of maize (*Zea mays* L.). *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 208-212

Seeds from eastern gamagrass, a perennial bunchgrass relative of maize, were chemically and nutritionally evaluated and compared to commercial maize seeds. The protein and lipid contents of gamagrass were 3 and 1.5 times greater than maize resp. while the starch content was 0.55 time lower. Gamagrass protein is typical of cereal grains, being rich in methionine and low in lysine. The oil from gamagrass is 10% higher in unsaturated fatty acids than maize oil. No nutritionally significant amounts of trypsin inhibitor or hemagglutinin activity were detected. Chem. evaluation and larvae bioassay indicated gamagrass seed is nutritionally comparable and in some ways superior to maize and additional breeding and plant development studies are warranted. AS

- 1806 Christian (P) and Subadra Sheshadri. Effect of addition of bovine milk and vegetable milks on the in vitro availability of iron from cereal meals. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 317-324

This study investigated the availability of Fe using an in vitro procedure, from freshly prepared vegetable milks and

compared it with bovine milk, and effect of addition of the vegetable milks on the availability of Fe from a standard cereal meal is also studied. Estimation of the total Fe content from bovine milk (BM), groundnut milk (GM) and soybean milk (SM) revealed that it was highest in case of SM followed by GM and BM. This trend was reversed for percent available Fe which was highest for BM followed by GM and SM. The in vitro availability of Fe from the cereal meal was low (3.7%). Addition of BM and GM enhanced the availability of Fe from the standard meal whereas SM had no particular enhancing quality. The practical implications of the findings for Fe nutrition in human are discussed. SRA

- 1807 El-Sakr (AS), Fahmy (L) and Basyony (AE). Identification of amino acids and sugars of Egyptian wheat, maize and rice germs. *Grasas y Aceites* 40(1); 1989; 22-25

Wheat and rice germs contained higher amounts of protein and amino acids than maize germ. Wheat germ contained 27.34% protein; 5.16 mg/g lysine, 5.16 mg/g valine and 10.67 mg/g leucine + isoleucine amino acids. Maize germ contained 9.74% protein; 2.12 mg/g lysine, 2.58 mg/g valine and 3.72 mg/g leucine isoleucine. Rice germ contained 19.73% protein, 4.21 mg/g lysine, 4.48 mg/g valine and 5.26 mg/g leucine isoleucine. Wheat and rice germs contained higher amounts of the identified sugars than maize germ. Wheat germ contained 103.78 mg/g maltose, while rice germ contained 78.76 mg/g, but maize germ contained 51.79 mg/g maltose from the total carbohydrate contents. AS

- 1808 Fast (RB), Lauhoff (GH), Taylor (DD) and Yotwood (SJ). Flaking ready-to eat-breakfast cereals. *Cereal Foods World* 35(3); 1990; 295-298

This feature article deals with the different types of flaking mills, materials of construction of flaking rolls, temp. control of rolls, and roll operations. PHR

- 1809 Fast (RB), Shouldice (FJ), Thomson (WJ), Taylor (DD) and Gotgood (SJ). Toasting and toasting ovens for breakfast cereals. *Cereal Foods World* 35(3); 1990; 299-309

This review article discusses commonly used general types of toasting process traditional rotary toasting oven, the conveyORIZED or flat band forced convection baking oven and the high velocity air infringement fluidized bed dryer or oven. The details of construction and operation are included in the article highlighting different aspects like temp. control, maintenance, sanitation and safety and relative versatility. PHR

Oats

- 1810 Wood (PJ), Braaten (JT), Scott (FW), Riedel (D) and Poste (LM). Comparison of viscous properties of oat and guar gum and the effects of these and oat bran on glycemic index. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 753-757

Healthy subjects consumed D-glucose (glucose) alone or in the presence of oat gum prepared in a pilot plant (PPOG) or commercial guar gum (GG). Both gums significantly and similarly decreased the postprandial glucose rise as indicated by the glycemic index (GI). The effect of PPOG in a normal meal situation was studied by addition to cream of wheat (CW) to mimic oat bran (OB) porridge. Again, PPOG significantly lowered the postprandial glucose rise. Relative to CW alone, the GI of OB (62%) was similar to that of PPOG plus CW (60%). PPOG was less viscous than both GG and a lab. prepared sample of oat gum (LPOG). However, apparent viscosity differences between the gums decreased with increasing shear rate and concn. LPOG was more pseudoplastic than GG, which in turn was more pseudoplastic than PPOG. At the concn. used in the acute meal tests, PPOG and GG reduced the rate of dialysis of glucose to a similar extent. AS

Rice

- 1811 Juliano (BO), Perez (CM), Komindr (S) and Banphotkasem (S). Properties of Thai cooked rice and noodles differing in glycemic index in non-insulin-dependent diabetics. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 369-374

Glycemic index responses of two cooked rices and six types of cooked noodles consumed by eight non-insulin-dependent diabetics correlated positively with *in vitro* starch digestibility of food slurry and negatively with amylose content of the food. Glutinous (waxy) rice had the highest values, and mung bean noodles the lowest. AS

- 1812 Raju (GH), Bhashyam (MK) and Srinivas (T). Factor affecting scutellum retention in milled rice. *Journal of Food Science and Technology (India)* 27(1); 1990; 7-12

The frequency of grains with scutellum in the 14 var. of milled rice varied from 12 to 86%. In the high scutellum retention (SR) var., a cementing material was present between the epithelial layer and endosperm cells. In low SR var., this material was absent. SR in milled rice increased with a decrease in the initial moisture of raw brown rice, by parboiling, and occurred more with Satake than McGill polisher. Broken in the brown rice prior to milling was associated with

low SR in milled rice. The thiamine content of milled rice with scutellum was more (124 to 138 $\mu\text{g}/100\text{g}$) than that without scutellum (80 to 84 $\mu\text{g}/100\text{g}$). High SR var. retained more thiamine than the low SR var. even after washing. SR in milled rice is thus nutritionally beneficial and can be enhanced by improving var. and processing factors. AS

- 1813 Watanabe (M), Miyakawa (J), Ikezawa (Z), Suzuki (Y), Hirao (T), Yoshizawa (T) and Soichi (A). Production of hypoallergenic rice by enzymatic decomposition of constituent proteins. *Journal of Food Science* 55(3); 1990; 781-783

A method is proposed to produce hypoallergenic rice usable for patients with rice allergy. Newly harvested rice grains were dipped in carbonate (pH 9) containing glycerin monooleate and actinase and then the mixture was exposed to a reduced pressure for degassing. The degassed mixture was incubated at 37 C for 24 h to hydrolyze proteins. The process produced rice grains from which the major allergenic globulin was decomposed. The product was evaluated by the radioallergosorbent tests (RAST), with the result that its RAST value suggested negative allergenicity in most cases. The products was clinically administered to 7 patients with atopic dermatitis and no allergic reaction was observed in 6 of the 7. AS

Rice flour

- 1814 Maga (JA) and Kim (CH). Co-extrusion of rice flour with dried fruits and fruit juice concentrates. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 182-187

Varying dry wt. amounts (0, 10, 20%) of prunes, raisins, figs and dried cranberries and 0, 3.5, and 7.0% dry wt. quantities of orange, pineapple, cranberry, and grape juice conc. with and without 0.5% added citric acid were blended with rice flour and water and extruded with a lab. Brabender single screw extruder to produce expanded snacks. Citric acid addition did not significantly influence extruder torque or yield but did increase dry fruit-based product density and decrease expansion. All products containing added citric acid were lighter in colour than no added acid counterparts. The addition of citric acid did not significantly influence sensory properties. All products judged had good acceptability. AS

Wheat

- 1815 Borel (P), Lairon (D), Termine (E), Grataroli (R) and Lafout (H). Isolation and properties of lipolysis inhibitory proteins from wheat germ and wheat bran. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 339-348

Proteins inhibiting pancreatic lipase *in vitro* have been isolated from wheat germ and wheat bran, with relative mol. mass ranging from 24,400 to 27,500. Inhibition of pancreatic lipase by the wheat germ proteins is related to their ability to interact with the emulsified substrate and to hinder the adsorption of the enzyme on the interface. The extent of inhibition depends on the amount of substrate and is independent of the enzyme concn. Bile salts forming micelles in the concn. range used are able to partially reverse the inhibition of pancreatic lipase by the wheat germ proteins. The nutritional significance of the data obtained is discussed. AS

- 1816 Megremis (CJ). Stabilizing wheat flakes with mixed tocopherols. *Cereal Foods World* 35(3); 1990; 316-317

Incorporation of tocopherols rich in gamma- and delta- form to an extruded wheat flake improved its stability against oxidation rancidity at a level as low as 50 p.p.m. PHR

- 1817 Osborne (BG), Barrett (GM), Laal-Khoshab (A) and Willis (KH). The occurrence of pesticide residues in UK home-grown, and imported wheat. *Pesticide Science* 27(1); 1989; 103-109

Residue levels of organophosphorus, organochlorine and carbamate insecticides, urea, carbamate and anilide herbicides, carbendazim, fumigants and bromide were determined in home-grown and imported wheat sampled at UK flour mills during the period February 1987 to December 1988. A total of 764 samples was analysed but not all the wheats were tested for all the residues; 140 of 474 samples examined for organophosphorus insecticides contained residues at levels above the reporting limit, 23 of 119 samples contained residues of gamma-HCH, seven of 104 contained carbon tetrachloride and one of 104 contained 1,2-dibromoethane. No residues of urea, carbamate or anilide herbicides, carbendazim, carbaryl or methyl bromide were detected in 32, 40, 44 and 45 samples resp. Inorganic bromide levels in 45 samples examined were consistent with natural occurrence. Only a single imported wheat was found to contain a residue (of 1,2-dibromoethane) at a level in excess of UK statutory max. residue levels. AS

- 1818 Saxena (AK), Sekhon (KS), Bakhshi (AK) and Singh Bawa (B). Factors affecting Pelshenke test as uniform wheat quality screening technique. *Journal of Food Science and Technology (India)* 27(1); 1990; 56-57

The whole meal disintegration time test (Pelshenke) showed that grinding method, yeast concn. and kneading affected the results considerably. More uniformity was observed in samples

ground using quadrumat junior mill. Reduced granulation increased Pelshenke values. The development of gluten through kneading increased the disintegration time as also induced reproducibility into results. Higher yeast concn. of 3.2% was found to reduce disintegration times which were in accordance with the results of other workers conducted on the similar test samples. AS

- 1819 Singh (PL) and Ahmad (SK). Quality assessment of wheat in flood affected areas of Saharsa in Bihar. *Journal of Food Science and Technology (India)* 27(1); 1990; 52-53

Flood affected areas surveyed just after flood and samples of wheat grain and flour were collected from various fair price shops and general stores. They were analysed for aflatoxin contamination and also for nutritive components (protein, sugar, starch). Out of 60 samples of grain and flour, almost 20% were contaminated with aflatoxin B₁; the level of contamination ranging from 70-339 MUg/kg. Deterioration of food constituents like protein, sugar and starch was recorded in all the samples as they were infected with *Alternaria alternata*, *Aspergillus flavus*, *Aspergillus niger*, *Fusarium*, *Penicillium* spp. etc. Deterioration was less in grains/flour having no aflatoxin contamination. AS

Wheat flour

- 1820 de Mucciarelli (SIL), Cid (JA), de Arellano (MAL), Fernandez (S), de Luquez (NG) and Muzaber (JE). Biological value of the protein concentrate of *Atriplex lampa* complementary value to wheat flour. *Archivos Latinoamericanos de Nutricion* 38(4); 1988; 844-851 (Es).

The *Atriplex lampa* Chenopodiaceae, is a very abundant bush in the arid and semiarid regions of our province. This work was undertaken to characterize from the chem. point of view, both the fresh leaves and the protein concn. (PC) obtained from them. A second purpose was to determine the biological value of the protein, and to evaluate its capacity as a complement to wheat flour (WF). Through this study, the leaf was shown to have high content of ashes, Na, K and silica, wheat accounts for its low palatability. The PC obtained has a protein concn. of 59.37 g/100 g and its biological value is limited by the S amino acids, with a chem. score of 85.70. Since the protein is poorly utilized, this results in a relatively low value of its net protein utilization (NPU), a fact which may be attributed to its low true digestibility. The studies on the complementary effects of PC on WF were made at three levels, i.e., 30, 50, and 60%, resp. The results revealed that the best complementation, measured by the N utilization, happened to be when 50% of the protein contribution was provided by the

A. Iampra protein conc. AS

- 1821 Ishida (K-I) and Nagasaki (M). Effects of proteases on textural properties of wheat flour dough. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 1003-1008 (Ja).

Effects of protease treatment on textural properties of wheat flour dough were investigated. The enzymes used were bromelain, papain, two kinds of fungal protease (Denazyme and Amano-A) and bacterial protease (Biopraxe). The max. amylograph viscosity of wheat flour, for both of hard type and medium type flour, decreased with an increase in the concn. of protease added. For the farinogram properties of wheat flour, these proteases decreased the dough development time and stability, and increased the weakness. The effects of bromelain were the most remarkable among the five proteases. On the extensography, an increase in extensibility and a decrease in resistance to extension were observed with increasing concn. of the protease. Bromelain was effective to dough of both types of flour, but papain and Denazyme were only effective to dough of medium type flour. Other proteases were less effective to dough of any type. AS

- 1822 Seguchi (M). Effect of heat-treatment of wheat flour on pancake springiness. *Journal of Food Science* 55(3); 1990; 784-785

Wheat proteins

Gliadins

- 1823 Masson (P), Popineau (Y) and Pineau (F). Limited hydrolysis of gamma-gliadin by pepsin. Fractionation and partial characterisation of large polypeptides. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 157-163

Large polypeptides resulting from limited peptide hydrolysis of purified gamma-gliadin (a wheat storage protein) differed by their sizes and their hydrophobicities. They were fractionated by gel filtration and reversed-phase high performance liquid chromatography. A semi-preparative procedure was introduced successfully and permitted to prepare the quantities required for their characterisation. Some of the polypeptides were constituted a single chain and corresponded to the proline- and glutamine-rich region of the gliadin. They had an apparent mol. wt. of 28,000, as estimated by SDS-PAGE. Others had apparent mol. wt. similar to that of native gamma-gliadin, but were composed of two or more peptide fragments linked together by disulphide bridges. Their characterisation after reduction and alkylation showed that pepsin had split only the non repetitive region of the mol. and that the repetitive domain was resistant to limited hydrolysis. Furthermore, the peptides

arising from the non-repetitive region were more hydrophobic than those corresponding to the repetitive domain. AS

MILLETS

- 1824 Geervani (P) and Eggum (O). Effect of heating and fortification with lysine on protein quality of minor millets. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 349-357

This study was designed to analyse the nutrient comp. and protein quality of five minor millets (Italian millet, French millet, Barnyard millet, Kodo millet and Little millet). Effect of heating and fortification with lysine on the utilisation of protein were the main focus of the study. The nitrogen (N) content of the millets ranged from 1.69 to 2.76% proximate comp. and dietary fibre was estimated. A reduction of 19-25 in true protein digestibility (TD) and increase of 4-18 in biological value (BV) was observed on autoclaving and both the differences were significant ($P < 0.05$) in all millets. Heat processing did not have a pronounced effect on digestible energy (DE). Fortification with lysine at 0.6/g 100 DM increased both the BV and net protein utilisation. Although both heat processing and lysine fortification improved protein utilisation, the effect of fortification was comparatively more than heating. SRA

- 1825 Roura (SI), Montecchia (C), Goldemberg (AL), Trucco (RE) and Crupkin (M). Biochemical and physicochemical properties of actomyosin from pre- and post-spawned hake (*Merluccius hubbsi*) stored on ice. *Journal of Food Science* 55(3); 1990; 688-692

Biochemical and physicochemical properties of natural actomyosin (NAM) from pre- and post-spawned hake stored on ice were studied. At the beginning of storage both reduced viscosity and ATPase activities of NAM from post-spawned hake were about 3 times higher than those of the pre-spawned ones, except for the Mg^{2+} (Ca^{2+})-ATPase. Higher loss of functional components during pre-spawned hake NAM purification was found compared to NAM from post-spawned fish. Reduced viscosity and Mg^{2+} (EGTA)-ATPase activity of NAM from both pre- and post-spawned hake decreased following ice storage. SDS-PAGE patterns of NAM from pre-spawned hake showed an absence of the myosin heavy chain and the presence of a 160 kDa component at zero time of storage. No proteolysis occurred in ice-stored fish caught in both gonadal stages. AS

Corn

- 1826 Artz (WE), Warren (C) and Villota (R). Twin-screw extrusion modification of a corn fiber and corn starch extruded blend. *Journal of Food Science* 55(3); 1990; 746-750, 754

Surface response modeling was used to characterize the effect of extrusion processing on the functional properties of corn fiber/corn starch formulations. Process parameters evaluated included screw speed (200 -500 rpm), temp. (90-150 C) and pH (3-11). Generally, the water holding capacity of starch increased with increasing extrusion temp. while the water holding capacity of the fiber decreased with increasing extrusion temp. The foam stability decreased, while the residual moisture increased, with an increase in fiber concn. X-ray diffraction profiles indicated that extrusion did not affect fiber crystallinity. No significant changes in the ratio of soluble to insoluble fiber were found as a result of extrusion. AS

- 1827 Camou-Arriola (JP) and Price (RL). Destruction of aflatoxin and reduction of mutagenicity of naturally-contaminated corn during production of a corn snack. *Journal of Food Protection* 52(11); 1989; 814-817

Naturally-contaminated yellow dent corn containing 1600 MUG total aflatoxin per kg was treated with 3% NaOH at 100 C for 4 min. After washing, the moisture was adjusted by autoclaving at 121 C and the product was deep fired at 196 C for 15 min to produce a corn snack. Samples were taken after each processing step. Aflatoxin levels and mutagenicity of acetone extractions of alkaline and acidified products were measured. There was over 99% destruction of the aflatoxin in the final product. Acidifying products after each stage and prior to analysis caused reformation as much as 18% of the original aflatoxin, however, the acidified final product showed no reformation at all. Mutagenicity determined by *Salmonella typhimurium* strains TA 98 and TA 100 decreased during processing. Mutagenicity of extracts of the final product was equal to that of the negative controls. The manufacturing process was effective in aflatoxin destruction and reduction of mutagenicity. AS

- 1828 Onigbinde (AO) and Akinyele (IO). Compositional and protein digestibility changes in maize (*Zea mays*) and cowpeas (*Vigna unguiculata*) after storage at ambient conditions. *Food Chemistry* 35(4); 1990; 315-321

Grains of maize and cowpea were stored in cloth bags for 7 months under ambient conditions of temp. (18-35.6 C) and

relative humidity (30-97%). There were no significant changes in the total soluble sugars, free amino nitrogen unstable acidity or pH of the grains ($P > 0.05$). There was a decrease in the invitro protein digestibility of corn grains and an increase in the protein digestibility of cowpea grains ($P < 0.05$). Cooking of stored corn grains resulted in an increase in the true digestibility above the level for the fresh sample ($P < 0.05$). Depreciation in the protein digestibility of grains during storage may be relevant to only the raw samples. AS

Corn meals

- 1829 Vajaranant (K) and Fields (ML). The production of vitamin B6 by microorganisms in corn meal. *Journal of Food Protection* 52(11); 1989; 827-828

Five microorganisms out of 22 cultures previously isolated from fermenting corn meal produced vitamin B6. These included *Hansenula subpelliculosa* (strain 1), *Moraxella* sp. (strain 4), and *Bacillus licheniformis* (strains 6, 9, and 10). Microorganisms not producing vitamin B6 were: *Streptococcus faecalis* (strains 3, 8, 25, and 34); *Lactobacillus brevis* (strains 11, 12, 14, 15, 16, 3, 38, 41, 43, 44, and 45); *Agrobacter* spp. (strains 22 and 23). *B. licheniformis* strains 6 and 10 were studied further to establish optimum conditions for vitamin B6 production in corn meal. For strain 6, optimal initial pH and temp. were 7 and 45 C resp. For *B. licheniformis* strain 10, there was no initial pH effect and the optimal temp. was also 45 C. AS

Corn starch

- 1830 de Padua (MR), Verde (O), de Orellana (ML) and Julio Arias. Effect of the incorporation of additives on the ageing of corn starch gels and arepas. *Archivos Latinoamericanos de Nutricion* 38(4); 1988; 883-906 (Es).

This research was carried out to investigate the effect of the incorporation of various additives on the ageing of corn starch and arepas. Starches were extracted from the endosperm of degerminated corn by a wet milling process, and its retrogradation, with or without the incorporation of additives was evaluated using the Brabender amylograph and by measuring the viscosity changes of the starch gels through time, using a Brookfield viscometer model RVT. The most effective additives in retarding the rate of ageing of starch gels, were used in the arepas. Likewise, trained panelists were utilized to find the levels of the additives incorporated in the arepas, by running taste threshold tests for each one of the additives. Textural changes of the arepas- maintained at two different

storage temp. 90 and 23 C were evaluated using an Instron texturometer. Preliminary test with the corn starch allowed to choose the following additives: distilled monoglycerides, guar gum and hydrogenated vegetable oil. The effect of 15 different combinations of these additives on the texture of arepas was then studied, and findings revealed that only three of them were able to totally revert the retrogradation process, and maintain the hardness and elasticity within the expected range of a fresh-made arepa, when this is reheated until reaching a max. temp. of 49 C. A 66% of the hardening of the arepas prepared without additives can be reverted with the reheating process, but only if the product has not suffered dehydration. When stored for 24 h at room temp., unpacked arepas have a surface moisture loss of 47%, and even if reheated, hardening becomes irreversible in 84.6% of them. AS

Pearl millets

- 1831 Khetarpaul (N) and Chauhan (BM). Effect of germination and fermentation on in vitro starch and protein digestibility of pearl millet. *Journal of Food Science* 55(3); 1990; 883-884

Germination of pearl millet grain for 24 h significantly improved its in vitro starch and protein digestibility. Fermentation of pearl millet sprouts by mixed culture combinations of yeasts and bacteria (*Saccharomyces diastaticus* and *Lactobacillus brevis*; *Saccharomyces diastaticus* and *Lactobacillus fermentum*; *Saccharomyces cerevisiae* and *Lactobacillus brevis*; *Saccharomyces cerevisiae* and *Lactobacillus fermentum*) resulted in a significant increase in protein and starch digestibility. The pearl millet sprouts fermented with mixed culture containing *S. diastaticus* and *L. brevis* had the highest in vitro starch digestibility, while the sprouts fermented with the culture containing *S. cerevisiae* and *L. fermentum* had the highest in vitro protein digestibility. AS

Pearl millet flour

- 1832 Rashmi Kapoor and Kapoor (AC). Effect of different treatment on keeping quality of pearl millet flour. *Food Chemistry* 35(4); 1990; 277-286

The flour of pearl millet (*Pennisetum americanum*) after different treatments, namely, addition of antioxidants (butylated hydroxyanisole, butylated hydroxytoluene and ascorbic acid), thermal treatment, defatting and salting was stored in earthen pots at prevailing room temp. (28 to 34 C) and relative humidity (60 to 80%) for 30 days. The flour was analysed periodically (10, 20 and 30 days) for keeping quality by chemical methods. The levels of peroxide and fat acidity

increased and that of unsaturated fatty acids decreased during storage. The development of peroxides in antioxidant treated flour samples was lower than other treated (thermal and salt) and untreated flour. Butylated hydroxyanisole and thermal treatments significantly retarded the increase in fat acidity values. The defatted flour had the lowest fat acidity and peroxide values, which did not vary during storage. The loss of unsaturated fatty acids was slightly less in flour treated with butylated hydroxyanisole and butylated hydroxytoluene. The proportions of unsaturated fatty acids remained almost constant in defatted flour. Microbiological examination of the flour samples revealed a considerable increase in fungal count while the bacterial count remained constant during storage. Butylated hydroxyanisole and ascorbic acid showed inhibitory effects against fungal growth. AS

Sorghum

- 1833 Aniche (GN) and Nwokedi (H). Preliminary studies on the effect of drying temperature and time on the concentration of dimethyl sulphide in sorghum wort. *Journal of Food Science and Technology (India)* 27(1); 1990; 13-14

Samples of sorghum malt germinated for 5 days were dried at 50, 60, and 70 C for 24 h. Samples were collected at 4 hourly intervals, mashed using 3 stage decoction method and dimethyl sulphide content in head space of samples was determined by a gas chromatographic method. Dimethyl sulphide levels decreased as drying temp. and time increased. AS

PULSES

- 1834 Macarulla (MT), Martinez (JA), Barcina (Y) and Larralde (J). Intestinal absorption of D-galactose in the presence of extracts from *Phaseolus vulgaris* hulls. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 359-367

In order to evaluate the influence of naturally occurring substances of legume constituents on nutrient utilisation the initial absorption of D-galactose in the presence of aqueous or alcoholic extracts, obtained from *Phaseolus vulgaris* hulls, has been measured by use of the in vivo successive absorption technique. Aqueous extracts inhibited significantly ($P < 0.01$). The uptake of D-galactose at different times of exposure, while no change in sugar transport were observed with the alcoholic solutions. Polyamide treatment of the aqueous extracts decreased its ability to inhibit sugar uptake. Kinetic studies showed that the aqueous fractions modify V_{max} values of D-galactose absorption and also K_{m} data. This

inhibition appeared to be reversible after short period exposure, affecting mainly the active component of transport. Hence it can be suggested that some substances, contained in aqueous extracts of *Phaseolus vulgaris* reduced sugar absorption, and also indicate that polyphenols are, at least partially, involved in this phenomenon. SRA

Beans

- 1835 Bressani (R), Navarrete (DA), Garia Sato (A) and Elias (LG). Culinary practices and consumption characteristics of common beans at the rural home level. *Archivos Latinoamericanos de Nutricion* 38(4); 1988; 925-934

A survey was carried out on housewives of rural bean-producing areas for the purpose of collecting information on bean selection procedures, culinary practices and bean consumption in rural homes from four areas of northeastern Guatemala. A sample of 10 families were selected at random from each of 19 municipalities. The questionnaire used had been pretested in two rural communities not included in the study sample. It was found that all families consumed common black beans, and on rare occasions beans of different colour or sp. With respect to cooking practices, it was found that beans are not usually soaked prior to cooking, and that few housewives added salt at the beginning of cooking. Two fractions are usually obtained, the cooked beans and the cooking broth. Another finding was that beans are consumed in four preparations. Cooked whole, strained and fried, ground and fried, and cooked and fried. Bean broth are consumed by both adults and children, and thick broth is preferred since it is considered to be more nutritious and better tasting. Children begin to consume bean broth as early as two months of age, and beans at 14 months. The average amount of broth ingested was 62 g, and whole cooked beans, 70 g. Mothers surveyed indicated that broth was administered to children because; it was nutritious (56% of the mothers); in order to teach children how to eat (15%); or because of its taste (9%). AS

- 1836 Stanley (DW), Wu (X) and Pihak (LC). Seed coat effects in cooked reconstituted bean texture. *Journal of Texture Studies* 20(4); 1989; 419-429

The contribution of seed coat to cooked reconstituted bean texture was assessed by measuring sensory and instrumental parameters of beans with and without coats and also seed coats alone. Exp. using white beans stored for one yr under tropical conditions to induce the hard-to-cook (HTC) defect or temperate conditions both resulted in reductions in the order of 50% in puncture force and sensory properties of beans when the seed

coat had been removed. HTC bean texture was influenced less by absence of the seed coat than texture of soft beans. Seed coats softened during cooking but those from HTC beans softened less than those from soft beans. It is possible that seed coats harden during tropical storage by a lignification-type mechanism. Beans with harder seed coats absorbed less water during soaking which may contribute further to bean hardness. AS

Bengal gram

- 1837 Semwal (AD) and Arya (SS). Effect of vegetable oils on the stability of carotenoids in fried Bengal gram dhal. *Journal of Food Science and Technology (India)* 27(1); 1990; 58-59

Effect of oils on the stability of carotenoids in fried Bengal gram dhal during storage has been studied. Relatively carotenoids in Bengal gram dhal were more stable when fried in vanaspati than in refined groundnut, sunflower and safflower oils. AS

Cowpeas

- 1838 Abudu (IA) and Akinyele (IO). The effect of germination on the oligosaccharides, trypsin inhibitors and nutrient content of cowpea milk. *Food Chemistry* 35(3); 1990; 161-166

Two cvs of cowpeas, 'big white' and 'small white', were germinated for 15 and 22 h resp. before milk was extracted using a set of nylon netting sieves. Ungerminated seeds of the cowpea cvs were similarly treated for milk extraction. The energy protein, moisture, total solids, oligosaccharides, trypsin inhibitor activity, total sugars, minerals and digestibility were determined using appropriate methods. The energy content of milk from germinated seeds was 20.5 kcal for the 'small white' and 16.5 kcal for the 'big white', while the corresponding figures for ungerminated beans were 29.1 and 42.4 kcal resp. In all cases, germination reduced the nutrient content as well as the oligosaccharides when compared with the milk from ungerminated cowpeas. Trypsin inhibitor activity was, however, still high in both the germinated and ungerminated milk samples while in vitro protein digestibility was not substantially changed in either var. Due to nutrient reduction, germination does not seem to be a good method of removing oligosaccharides which may produce flatulence in young children consuming cowpea milk. AS

- 1839 Akinyele (IO) and Abudu (IA). Acceptability and nutrient content of milk substitutes from four cultivars of cowpeas (*Vigna unguiculata*). *Journal of Food Science* 55(3); 1990; 701-702, 707

Milk was extracted from 4 cvs of cowpeas and analysed for their nutrient content. The protein content of the milk substitutes varied from 1.2-3.0 g, energy, 17.9-42.4 Kcal; total solids 4.2-10.7 g and sugars from 0.2-0.6 g per 100 mL. The protein digestibility was from 56.0-78.5% and trypsin inhibitor activity was 5.8-7.1 TIU/mL. The cvs had an effect on the yields, the total solids, the energy, protein total sugars, trypsin inhibitor activity, and digestibility of the milk substitutes. AS

- 1840 Hung (Y-C), Mcwatters (KH), Phillips (RD) and Chinnan (MS). Effects of pre-decortication drying treatment on the microstructure of cowpea products. *Journal of Food Science* 55(3); 1990; 774-776, 807

A pretreatment process developed to prepare cowpeas for mechanical decortication by dry abrasion involves wetting, equilibrating, and drying. Drying temp. of 50, 70, 90, 110 and 130 °C affected the microstructure of cowpea seeds, meal and akara (fried cowpea paste). Severe heat treatment damaged the middle lamella of cotyledon cells, changed the birefringence property of starch granules, reduced the amount of air incorporated in whipped paste and produced akara with a non-uniform, dense structure. AS

- 1841 Nnanna (IA), Phillips (RD), McWatters (KH) and Hung (Y-C). Effect of germination on the physical, chemical and sensory characteristics of cowpea products. Flour, paste, and akara. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 812-816

Physicochemical and sensory characteristics of products made from cowpeas that were ungerminated (UN) or germinated at 25 or 30 °C for 24 h (G25 and G30, resp.) were assessed. Nitrogen solubilities of UN, G25, and G30 were similar. Electrophoresis revealed minor changes in proteins due to germination. Pastes of G25 or G30 had higher flow consistency (η) and apparent viscosity and possessed better frying characteristics than paste of UN. Germination increased the hardness, elasticity, gumminess, and chewiness of akara (fried cowpea paste) but did not affect cohesiveness. The derived instrumental colour function was higher for G25 and G30 flour and akara than for UN products. Among sensory measurements, germination significantly improved the crust colour of akara but slightly reduced the ratings for moistness, tenderness, and flavour. Overall acceptability was not reduced by germination. AS

- 1842 Pappas (G) and Rao (VNM). Effect of temperature and moisture content on the viscoelastic behaviour of cowpeas. *Journal of Texture Studies* 20(4); 1989; 393-407

The viscoelastic parameters of cowpeas (*Vigna unguiculata*) were studied at different temp. and moisture content combinations. Cowpeas were tested at temp. of 25, 45 and 70 °C and moisture contents of 13.9, 19.6 and 22.4% dry basis on an Instron Universal Testing Machine using stress relaxation techniques. The response of cowpeas was characterized by two Maxwell bodies in parallel without the incorporation of a residual spring. The relaxation curves (uniaxial modulus versus time) were used to calculate temp. and moisture shift factors, which subsequently led to the construction of a single master response curve. Cowpeas are both thermo-rheologically and hydro-rheologically simple biological materials. AS

Faba beans

- 1843 Bera (MB), Sahu (KL), Mukherjee (S), Bargale (M) and Sharma (YK). Temperature dependence of the soaking and cooking rate of faba bean (*Vicia faba* L.) dal. *Journal of Food Science and Technology (India)* 27(1); 1990; 15-18

The rate equation involved two parameters i.e., hydration constant (β) and diffusion constant (D) and their dependence on temp. has been studied. Then hydration constant increased with temp., while the diffusion constant increased with the increase in temp. and initial moisture content. Similarly, activation energy required during soaking decreased with increase in the initial moisture content. Diffusion related activation energy did not show any significant relationship with the initial moisture content. Various empirical equations developed for the prediction of the rate of moisture absorption, hydration constant, and diffusion constant are reported. The correlation coeff. (r 0.8 - 0.9) of these empirical equations are found to be highly significant. AS

- 1844 Ndzondzi-Bokouango (G), Bau (HM), Giannangeli (F) and Derby (G). Chemical composition and nutritive value of faba bean. *Sciences Des Aliments* 9(4); 1989; 785-797 (Fr).

Effects of the duration of germination on nutritional value and biochemical constituents of the broad bean (*Vicia faba* L.) (ASCOTT) have been studied. The germinated seeds flour had a higher content of proteins and non-protein N (dry matter basis) than that of non-germinated seeds. After a six-day germination, the starch content of seeds decreased by 31.4%; 84% of tannoids and polyphenols of seeds hulls were also eliminated. Oligosaccharides (raffinose, stachyose and verbascose) of seeds were almost completely hydrolyzed. Germination induced an increase of total ethanol soluble sugars and sucrose content but did not have much effect on the dietary fibers of seed hull and trypsin inhibitors. The aspartic acid

content increased after six-day germination. The present results show that germination brought about a decrease of PER (Protein efficiency ratio) value and of food intake of the broad bean the lowest value was observed with four-day germinated seeds flour. Thermal treatment led to a significant increase of PER value and food intake of rats for both germinated and non-germinated seeds. AS

Green beans

- 1845 Aparicio (MP), Rivas (JC), Santos (C) and Garcia (C). The influence of storage conditions on the quality of frozen green beans (var. Chekmate). *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 255-265 (Es).

Green peas

- 1846 Lee (HC) and Klein (BP). Classification of green pea peroxidases by preparative isoelectric focusing. *Journal of Food Biochemistry* 14(2); 1990; 137-152

Green pea peroxidase isoenzymes were partially purified, identified, and grouped by preparative isoelectric focusing in granulated gel (PEGG), using a modified cascade method. Isoenzyme patterns were detected utilizing a substrate impregnated paper print technique. Direct application of crude extract on PEGG proved to be a valuable tool for partial purification of peroxidase isoenzymes. A substrate-impregnated paper print technique enabled the detection of isoenzyme patterns and may replace the time-consuming conventional peroxidase activity assay. Twelve isoenzymes (pIs ranging from 5.5-8.6), isolated on analytical thinlayer isoelectric focusing on polyacrylamide gel, were isoelectrically homogeneous. AS

Kidney beans

- 1847 Alli (I), Kermasha (S) and Mehran (M). Fractionation of extracts and crystalline and non-crystalline proteins from white kidney beans (*Phaseolus vulgaris*) by ion exchange high performance liquid chromatography. *Journal of Food Science* 55(3); 1990; 777-780, 836

Sodium hydroxide solution (0.02%) and citric acid solutions (0.8N, pH 5.5, CA1; 0.60N; pH 3.5, CA2) were used to extract proteins from white kidney beans (*Phaseolus vulgaris*). The extracts were subjected to ion-exchange high performance liquid chromatography (IE-HPLC) using a phosphate elution buffer (20mM, pH 7.0). The charge properties of the protein fraction present in the NaOH extract and the CA1 and CA2 extracts were similar although the relative proportion to total peak area represented by each fraction was different in the different

extracts. IE-HPLC of the isoelectric precipitate (amorphous microstructure) isolated from the CA1 (bipyramidal crystalline microstructure) and the CA2 (spheroidal microstructure) extracts indicated striking differences in the charge properties of the proteins which constituted the isolates. IE-HPLC also demonstrated that the precipitation processes did not affect the charge properties of the proteins which remained after the proteins were recovered from the different extracts. AS

Mungbeans

Mung bean starch

- 1848 Califano (AN) and Anon (MC). Differential scanning calorimetry of mung bean starch. *Journal of Food Science* 55(3); 1990; 771-773

Mung bean starch water mixtures at water content between 13.6% and 90.2% (vol. fraction of water V_1 0.20 and 0.94) were studied by differential scanning calorimetry (DSC) and subjected to microscopic examination afterwards. Only a monophasic endotherm appeared for water contents above 67% while for water contents between 67% and 37.3% a biphasic endotherm was found by DSC. No endothermic transition was observed for water levels below 37.3%. The melting temp. of the most perfect crystallites was correlated to the volumetric fraction of water, thus, enthalpy, entropy and extrapolated melting temp. of the transition were calculated. AS

Peas

- 1849 Rincon (F), Zurera (G), Moreno (R) and Ros (G). Some mineral concentration modifications during pea canning. *Journal of Food Science* 55(3); 1990; 751-754

Changes in the mineral content of peas (*Pisum sativum*, L.) as a function of size during commercial processing were studied. Peas were divided into four levels of maturity, and samples were taken on different sizes of peas at various stages of the canning process. Mineral content was determined by atomic absorption spectrophotometry. Significant changes were found in the content of Cu, Fe, Mg, and Zn during commercial canning, but these were dependent on pea size only in the case of Cu, Fe and Zn. Highest total losses for Cu and Zn were obtained in immature stages while Fe losses were highest at mature stages. AS

- 1850 Tome (D) and Garborit (T). Amounts and electrophoretic patterns of trypsin inhibitors in the seeds of winter and spring pea (*Pisum sativum* L.) cultivars. *Sciences Des Aliments* 9(4); 1989;

763-768

The trypsin inhibiting activity was higher in the seed of a winter ('Frimas') than in a spring ('Amino') pea cv. This quantitative variation was linked to qualitative differences in the electrophoretic pattern of the trypsin inhibitors present in the seeds. Eight bands with antitryptic activity were detected in the winter cv. In the spring cv. the same eight bands were also present together with four additional acidic bands. These differences would be of interest for breeding purposes. AS

- 1851 Premlata Singh, Sita Bhagat and Ahmad (SK). Aflatoxin elaboration and nutritional deterioration in some pulse cultivars during infestation with *Aspergillus flavus*. *Journal of Food Science and Technology (India)* 27(1); 1990; 60-62

Thirty eight different cv. of pulses were screened to determine the varietal responses in respect of aflatoxin production. Two of them (Gram var., 'H-208', and soybean var. 'PK-746') were highly resistant against aflatoxin elaboration while other exhibit different degrees of resistance and susceptibility. Biochemical analyses of healthy seed showed that the amounts of total phenol and protein were greater in resistant var. while the amount of total sugar was more in susceptible var. of the same pulses. Deterioration in protein, total sugar and phenols has been noted during infection in all samples, however, in general except soybean, the percentage of deterioration was more in susceptible var. than resistant var. AS

Tepary beans

- 1852 de Mejia (EG), Grajeda Cota (P), Celada (E) and Valencia (ME). Characterization of the nutritional potential of tepary bean (*Phaseolus acutifolius*) grown in Mexico. *Archivos Latinoamericanos de Nutricion* 38(4); 1988; 907-924 (Es).

The chem., physical, antiphenological and biological quality of the protein of three var. ('white', 'brown' and 'black') tepary bean (*Phaseolus acutifolius*) were studied. Its proximate comp. was determined, as well as water absorption, hardness of the seed, tannin content, trypsin inhibitors and lectins. Beans were also submitted to differential scanning calorimetry of the starch. The biological quality of its proteins was also established, based on the protein efficiency ratio (PER) and protein apparent digestibility. It was found that the protein content of the bean was high (25%). The white var. had the highest water absorption and the lowest hardness of the seed when compared with the other var. ($P < 0.05$). The 'black' var. had a lower starch gelatinization energy and a

higher cooking time than the 'white' and 'brown' var. The tannin content of the three var. was low, particularly in the 'white' one. The trypsin inhibitor and lectin content were relatively high in the raw beans, but disappeared almost totally during cooking. The biological quality of the tepary proteins was higher than that of the common bean cultivated under the same conditions. More evidently so in the 'white' bean (PER = 1.48 as compared to 1.23 in pinto bean). It can be concluded that the tepary bean is a potentially good protein source and has also a great potential and donor of genes for the obtention of better bean var. from the culinary, nutritional and toxicological points of view. AS

- 1853 De Mejia (EG), Hankins (CN), Paredes-Lopez (O) and Shannon (LM). The lectins and lectin-like proteins of tepary beans (*Phaseolus acutifolius*) and tepary-common bean (*Phaseolus vulgaris*) hybrids. *Journal of Food Biochemistry* 14(2); 1990; 117-126

High levels of lectin activity were found in 60 cultivated and 10 wild tepary (*Phaseolus acutifolius*) accessions. No lectin deficient var. were observed and all examples studied contained both the phytohemagglutinin-E and L-like lectins. There appeared to be no obvious differences between the wild and cultivated forms of the tepary lectins and all teparies studied contained lectin-like proteins in addition to the tepary lectins. One of the lectin related proteins (40 K dalton subunit) was present in all teparies and may be comparable to arcelin, a lectin found in certain wild accessions of *Phaseolus vulgaris*. All wild teparies contained a lectin related polypeptide of about 34 K daltons which appears to distinguish the wild teparies from the cultivated forms. Three tepary-common bean hybrids were examined and one hybrid was found to be expressing both tepary and common bean lectin genes. AS

OILSEEDS AND NUTS

Cashew nuts

- 1854 Samant (SK) and Rege (DV). Carbohydrate composition of cashew nut and charoli. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 164-168

Seed kernels of charoli and cashew nut were analysed in detail for their carbohydrate fractions. Carbohydrates of charoli kernels were mainly composed of 3.19% sugars, 0.63% starch and 6.83% total dietary fibers, while those of cashew kernels were made up of 5.86% sugar, 12.22% starch and 5.86%

total dietary fibers. Values for total carbohydrates obtained as summation of individual components compared well with those obtained during carbohydrate analysis by differences. Every carbohydrate fraction was however contaminated with protein. The method used here measured alcohol soluble sugars and starch, which were left unaccounted by Monte and Maga; thus giving a clearer picture of seed carbohydrates. Dietary fibre values obtained by detergent extraction methods were 3.46% and 2.71% for charoli and cashew nut kernels indicating loss of soluble components in detergent solution. AS

Groundnuts

- 1855 Bockelee-Morvan (A), Fanguin (J) and Schilling (R). Edible groundnut seed technology and industrial installations. *Oleagineux* 44(7); 1989; 365-373 (Fr).

The world edible groundnut market is of considerable size and is continually expanding: 640, 000 tonnes in 1986, more than half of which was imported into the EEC. It is dominated by three countries: USA (44%), China (33%) and Argentina (17%) with Africa only having a very small share, whereas many countries are important groundnut oil producers. Edible groundnut production for export requires high performance industrial installations, which are the only sure way of guaranteeing the quality required by buyers, especially the absence of aflatoxin. These installations particularly need to have special shellers which give whole unskinned seeds. Calibrators, densimetric sorters and colorimetric sorters, refrigerated or nitrogen vacuum storage. They can be completed by installations for skinning, roasting and peanut butter production, depending on estimated outlets. These installations can also be used to produce calibrated groundnut seednuts, coated with fungicide and insecticide for protection on emergence. In Africa, seeds are currently supplied in their shells and shelled by hand (120 h hectare). The availability of high quality ready-to-use seeds for farmers would represent considerable progress. AS

- 1856 Muego (KF), Koehler (PE) and Resurreccion (AVA). Effect of temperature, time and number of water extractions on the physicochemical and flavour characteristics of peanuts. *Journal of Food Science* 55(3); 1990; 790-792

The effects of temp., time, and number of extraction on the colour, gas chromatographic profile, and flavour characteristics of water extracted peanuts were determined. Temp. was the major factor which affected these attributes. Increasing the extraction temp. resulted in darker coloured peanuts with less chroma, less raw peanut flavour, and more cooked peanut flavour. It also led to a significant decrease

in flavour volatiles. Based on the results, the recommended conditions are to water extract at 90 °C for 10 min three times to produce peanuts which are light in colour and bland in flavour. AS

- 1857 Nagaraj (G), Sheela Chauhan and Ravindra (V). Peanut composition and oil quality as influenced by genotype and harvest stages. *Journal of the Oil Technologists Association of India* 21(3); 1989; 60-63

Peanut var. of four botanical groups, Spanish ('GG2', 'J 11' and 'TMV 2'), Valencia ('Gangapuri', 'EC 21137-1' and 'MH 2'), Virginia bunch ('Robut 33 1', 'BG1', and 'TMV 10') and Virginia runner ('GAUG 10', 'M 13' and 'S 230') were harvest at different maturity stages in 1985 summer. Pod yield, kernel comp. and oil quality have been studied. 'GAUG 10', followed by 'GG 2' and 'S 230' gave higher pod and oil yields. Shelling and SMK (sound mature kernels) % were significantly higher in Spanish var. Oil content was higher in 'TMV 10' (51.3%), 'M 13' (50.3%) and 'GAUG 10' (50.1%) while protein content was higher in 'J 11' (29.5%) followed by 'TMV 2' (28.4%). Protein yield was highest in 'GG 2' followed by 'J11', 'GAUG 10' and 'TMV 2'. Oil stability parameters namely, 18:1/18:2 ratio and iodine value were better in runner var. while the nutritional quality was better in Valencia types. In general, the yield and quality improved with maturity in all the botanical groups. Early harvests resulted in a reduction of oil and protein yields along with impairment of oil quality. AS

- 1858 Wallerstein (IS), Merin (U) and Rosenthal (I). Comparison of kernels of three Virginia type peanut cultivars. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 179-181

The chem. comparison of the kernels of peanuts of three Israeli breeds of Virginia type cvs was determined. Accelerated oxidation tests indicated that kernels of the var. 'Shosh' were the least resistant to rancidity. AS

Linseeds

- 1859 Vasishtha (AK), Bajpai (M), Pandey (S) and Rai (M). Studies of the seed characteristics and composition of the oil in linum. Exotic culture (EC). *Journal of the Oil Technologists Association of India* 21(3); 1989; 47-59

276 exotic cultures of linseed (*Linum usitatissimum* L.) were analysed for oil, protein, sp. gr., refractive index, iodine value, saponification value and fatty acid comp. Variability was vast among these characters. The iodine value and linolenic acid content were positively associated with each other and negatively associated with stearic acid and oleic

acids under each sub-group of the oilseed. KAR

Rapeseeds

- 1860 Gueguen (J), Bollecker (S), Schwenke (KD) and Raab (B). Effect of succinylation on some physicochemical and functional properties of the 12S storage protein from rapeseed (*Brassica napus*. L.). *Journal of Agricultural and Food Chemistry* 38(1); 1990; 61-69

The physicochemical and functional properties of the native and succinylated 12S storage protein from rapeseed have been studied and found to depend on the degree of modification. Ultracentrifugation and isoelectric focusing were used for the characterization of the protein samples. The functionality was studied through adsorption kinetics at air/water interfaces and foaming and emulsifying properties. Succinylation results in a significant change of the interface adsorption kinetics of the native rapeseed globulin and in an improvement of foam capacity and stability as well as emulsion stability. These effects, greatly influenced by the level of succinylation, are discussed as being related to the dissociation of the oligomeric 12S globulin into subunits, to the unfolding of these subunits, and to the charge variations, depending on the degree of modification. AS

- 1861 Zhou (B), He (Z-Q), Uy (HM) and Mukherjee (KD). Proteins from double zero rapeseed. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 690-694

Solubility profiles of protein, phytic acid, and glucosinolates in aqueous electrolytes of varying pH were found to be similar for defatted meals from two var. of double zero (low glucosinolate/low erucic acid) rapeseed (*Brassica napus*) and conventional Chinese rapeseed (*Brassica juncea*). All three meals yield upon extraction with aqueous electrolytes at pH 4-5 products that are enriched in protein to the extent of 20-35%. Simultaneously, the level of phytic acid in the extracted meals is reduced by about one-third while the glucosinolates are virtually eliminated. Extraction of the defatted meals at pH 12-13 results in dissolution of > 90% of the protein, one-third of the phytic acid, and < 10% of the glucosinolates. The resulting extract provides upon precipitation of the protein at pH 4-5 protein isolates (> 90% protein) in yields of about 60% having phytic acid content of 2-2.5% without any detectable levels of glucosinolates. The amino acid comp. of the meals and protein isolates indicate favorable nutritive value of such products. AS

Sesame

- 1862 Salgado (JM) and Goncalves (CMM). Study of the sesame seed (*Sesamum indicum* L.) II. Use of the meal in protein mixtures. *Archivos Latinoamericanos de Nutricion* 38(2); 1988; 312-322 (Es).

The results obtained in the first part of this study demonstrated that the sesame flour protein is of reasonable quality and can be utilized, although it has a low lysine content and is rich in sulphur amino acids. Based on the initial data, the sesame flour was supplemented with other meals: "Cariocba" beans, pigeon pea, and soybean. Nine diets were prepared and the best combination was that of 50% sesame flour protein and 50% pigeon pea, the PER of which was 2.28. Breads were made with these system as follows; 100% sesame flour, 100% wheat flour, 50% sesame flour + 50% wheat flour, 30% sesame flour + 70% wheat flour, 30% sesame flour + 30% soybean flour + 40% wheat flour. These were evaluated through sensory analysis by a grading system. Good acceptance was obtained with the bread prepared with 30% sesame flour + 70% wheat flour. Its external and internal appearance, as well as its organoleptic characteristics were close to the bread, with 100% wheat flour. Sesame flour at the 50% proportion gave a bread of medium quality. The protein mixtures of sesame flour and soybean flour were well accepted. Some of the panel members reported that it has a taste somewhat like integral bread. AS

- 1863 Salgado (JM) and Goncalves (CMM). Study of the sesame seed (*Sesamum indicum* L.) I. Methods for obtaining an edible white meal. *Archivos Latinoamericanos de Nutricion* 38(2); 1988; 306-311 (Es).

Methods for processing of the sesame seed were tested in order to obtain an edible meal. The nutritive value of this meal was evaluated by chem. and biological analyses. According to the results obtained, it was concluded that the best method is to submit the seeds to a maceration process and to a vapor treatment. The sesame flour protein is of reasonable quality, rich in sulphur amino acids. Although it has a low lysine level, it can be utilized for complementing the amino acid pattern of other mixtures. AS

Soy products

Soy milk

- 1864 Bouno (MA), Niroomand (F), Fung (DYC) and Erickson (LE). Destruction of indigenous *Bacillus* spores in soy milk by heat. *Journal of Food Protection* 52(11); 1989; 825-826

Boiling of soy milk in preparation for soy yoghurt production does not destroy the indigenous *Bacillus* spores which may affect the fermentation process. Soymilk (2.2×10^3 CFU/ml) boiled for 1 min in a microwave had 33 CFU/ml, steamed for 20 min at 110 °C had 25 CFU/ml, and autoclaved at 121 °C for 15 min had no detectable organisms ($< 1 \times 10$). Soy yoghurt made from these heat-treated soy milks had 4.2×10^6 *Bacillus* spores/ml, 3.4×10^4 *Bacillus* spores/ml, and no detectable spores, resp. The authors recommend autoclaving (121 °C, 15 min) soy milk before performing research work on microbiology and biochemistry of soy yoghurt fermentation. AS

Soy sauces

- 1865 Macias-Matos (C), Garcia-Pino (C) and Arias-Verdes (JA). Determination of di-n-octyl tin stabilizers, in PVC bottled soy sauce. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 281-284 (Es).

A suitable method is described for the detn. of di-n-octyl tin stabilizers in soy sauce packed in PVC bottles and stored up to 24 months. Organotin was extracted from soy sauce, separated by TLC and determined by the formation of a coloured complex Sn-quercetin with a max. absorption at 428 nm. The detection limit and the variation coeff. were 0.023 p.p.m., and 15.2%, resp. The soy sauce stored in PVC bottles contained 0.023-0.030 p.p.m. (Sn). These values are below the max. admissible level: 0.1 p.p.m. AS

Soybeans

- 1866 Grant (G). Anti-nutritional effects of soybean. A review. *Progress in Food and Nutrition Science* 13(3/4); 1989; 317-348

This article reviews anti-nutritional effects (growth inhibition, effects upon reproduction, pancrease function, long-term effects on the pancrease, effects of dietary soybean upon organs and tissues), effects of fractions and proteins (aqueous insoluble residue, acid precipitable proteins, whey diffusate, whey proteins, anti-nutritional factors present in the whey protein fraction, trypsin inhibitors, lectin and other deleterious factors. 122 references. SRA

- 1867 Taira (H), Tanaka (H) and Saito (M). Total sugar, free type of total sugar and free sugar contents of domestic soybean seeds. Quality of soybean growth in Japan. Part 18. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 968-980 (Ja).

Soy proteins

- 1868 Garcia Chacon (EJ), Satterlee (LD) and Hanna (MA). Heat induced gels from partially hydrolyzed soy protein isolate. *Journal of Food Biochemistry* 14(1); 1990; 15-29

Heat induced gels can be obtained from partially hydrolyzed soy protein isolate (HSPI). The gel forming ability of each of the HSPI fractions (peptides of varying mol. wt. and solubility) were studied, after being separated by preparative Sephadex gel filtration chromatography. The insoluble peptide fraction had no gel forming ability. Peptides larger than 5,000 Daltons, those lower than 5,000 Daltons and a fraction of the very hydrophobic peptides formed weak gels when heated alone. Interactions between several peptide fractions were necessary in order to yield a gel with the strength of the one formed by whole HSPI. A mechanism explaining (1) the action of the proteolytic enzyme in breaking down the protein and (2) the peptide interaction needed for the gel formation is proposed. AS

- 1869 Hartnett (EK) and Satterlee (LD). The formation of heat and enzyme induced (plastein) gels from pepsin-hydrolyzed soy protein isolate. *Journal of Food Biochemistry* 14(1); 1990; 1-13

A gel prepared by heating pepsin-hydrolyzed soy protein isolate (HSPI) had a higher turbidity and viscosity and less solubility than did its starting hydrolyzate. The gelling characteristic of the heated hydrolyzate were possibly due to hydrophobic interactions, as opposed to peptide bond reformation. The presence of pepsin was found to be necessary for gel formation at 37 C but could be successfully replaced by heat. Incubation of the concentrated HSPI at 95 C for 30 min was optimal for heat-induced gel formation. When soy protein isolate (SPI) was hydrolyzed with papain or bacterial protease, little gelation occurred (either by heat or enzyme induced gelation treatments). AS

- 1870 Kim (Lee) (SY), Park (PS-W) and Rhee (KC). Functional properties of proteolytic enzyme modified soy protein isolate. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 651-656

The effects of proteolytic enzyme modification of soy protein isolate (SPI) on its mol. and functional properties were evaluated by treating a commercial SPI, Ardex F, with Alcalase, alpha-chymotrypsin, trypsin, Liquozyme, and rennet. Trypsin effectively decreased the mol. size of SPI followed by Alcalase and alpha-chymotrypsin. Hydrolytic breakdown occurred more extensively in the alpha-, alpha- and Beta- subunits of 7S globulins than in the acidic and basic polypeptides of 11S globulins. Partial hydrolysis of SPI contributed to improving

its solubility at pH 7.0 and 4.5 emulsifying capacity, and ability to undergo thermal aggregation. The extent of contribution was dependent upon the enzymes used, duration of proteolytic treatment, and functional properties sought after. AS

- 1871 Miyawaki (O), Sato (Y), Yano (T), Ito (K) and Saeki (Y). Fundamental aspects of viscosity monitoring by the hot wire technique. *Journal of Food Science* 55(3); 1990; 854-857

Fundamental aspects of the monitoring of viscosity by the hot wire technique in stagnant test fluid was investigated. The behaviour of the hot wire viscosity sensor was well described, theoretically, by the stagnant layer analysis combined with the Ostrach solution for natural convection heat-transfer from a vertical plate. To improve the sensitivity of the sensor to the change in viscosity of a test fluid, lower curvature for the sensor structure and higher heat flux for the operating condition were recommended theoretically and proved experimentally. As a practical example, the change in apparent viscosity during the coagulation of soy protein was monitored using the hot wire sensor. AS

- 1872 Wagner (JR) and Anon (MC). Influence of denaturation, hydrophobicity and sulphhydryl content on solubility and water absorbing capacity of soy proteins isolates. *Journal of Food Science* 55(3); 1990; 765-770

Solubility and water absorbing capacity of commercial soy protein isolates were correlated with structural parameters. The physico-chemical properties studied were degree of protein denaturation, surface hydrophobicity and sulphhydryl groups. The results indicated that solubility and water absorption were affected differently as the parameters were varied. These functional properties depended on more than one structural parameters. Solubility in 0.2M NaCl solution provided information about the degree of denaturation of soybean protein isolates. Isolates with highly denatured proteins, high surface hydrophobicity, low solubility in 0.2 M NaCl solution and low SH exhibited the highest water absorbing capacity. AS

Sunflowers

- 1873 Handoo (SK), Sanjoy Gupta and Agarwal (TN). Indian sunflower lecithin. *Research and Industry, India* 35(1); 1990; 35-36

Lecithin was recovered from the dewaxed sunflower oil and analysed. The main constituents are phosphatidyl choline, phosphatidyl ethanolamine, phosphatidic acid, and inositol phosphatides. The fatty acid comp. of phosphatides followed the same pattern as the oil fatty acids except for palmitic

acid which was found 2-3 times greater in the phosphatides than in the seed oil. The lecithin contained acetone insoluble matter 64.0%, moisture 0.7%, benzene insolubles 0.3%, triglycerides 35.0% with an acid value (% oleic acid) of 23.0. The colour is comparable to imported soy-lecithin. KAR

- 1874 Mok (C) and Hettiarachchy (NS). Moisture sorption characteristics of ground sunflower nutmeat and its products. *Journal of Food Science* 55(3); 1990; 786-789

Moisture sorption characteristics of sunflower nutmeat products (ground nutmeat, meal, protein conc. and protein isolate) were investigated at temp. 10, 20 and 30 C, and the results were analyzed according to various sorption isotherm models. The best-fit models were the GAB (Guggenheim-Anderson-de Boer) model for the ground nutmeat and the cubic polynomial model for the meal, the protein concentrate and the protein isolate. The Chen-Clayton model was the best-fit model for describing temp. effect in all the materials studied. The GAB monolayer values were higher than the BET monolayer values for the materials studied. AS

- 1875 Salgado (JM) and Chieus (E). Utilization of sunflower (*Helianthus annus*, L.) in human foods. I. Obtention of sunflower meal, protein concentrate, and complementation of the meal, with the amino acids lysine and methionine. *Archivos Latinoamericanos de Nutricion* 38(2); 1988; 288-296 (Es).

Results suggested that the sunflower seed obtained by thermic treatment has a higher protein value than when untreated. The flour thus treated is of better protein quality when supplemented with 0.34% lysine. The sunflower seed not subjected to thermic treatment, and supplemented with different levels of the amino acid methionine, did not improve the protein quality of the products. The protein conc. of the sunflower seeds shows a protein quality as well as a protein efficiency ratio (PER) relatively low, probably due to the lack of lysine. AS

- 1876 Salgado (JM) and Chieus (E). Utilization of sunflower (*Helianthus annus*, L.) in human foods. II. Enrichment of the sunflower protein concentrate with fish and sesame meals. *Archivos Latinoamericanos de Nutricion* 38(2); 1988; 297-305 (Es).

The first part of this study revealed that a sunflower meal submitted to thermic treatment resulted in a protein of better quality when supplemented with lysine, while the meal not subjected to thermic treatment, supplemented with methionine, did not increase its nutritional value. These data indicated, therefore, that the limiting amino acid in sunflower meal is

lysine, and not methionine. Based on these findings, and in order to confirm previous results, fish flour (high in lysine) and sesame flour (high in methionine) were used to enrich the amino acid pattern of the sunflower protein conc. Three diets were thus prepared at the 10% protein level, containing sunflower protein conc. which provided 70% protein, plus sesame flour (30% protein) sunflower protein conc. with 70% protein, and fish flour (30% protein) sunflower conc. with 70% protein, sesame flour with 20%, and fish flour with 10% protein. These following conclusions were derived on the basis of the analysis of these results. Supplementation of sunflower conc. with 30% sesame flour does not produce a product of high nutritional value, once again indicating that lysine and not methionine is the limiting amino acid. Supplementation of the sunflower protein conc. with fish flour (high in lysine content) presents a protein efficiency ratio (PER), practically equal to that of the casein pattern. AS

TUBERS AND VEGETABLES

- 1877 Heil (JR), Perkins (WE) and McCarthy (MJ). Use of magnetic resonance procedures for measurement of oil in French-style dressings. *Journal of Food Science* 55(3); 1990; 763-764, 884

Magnetic resonance imaging and spectroscopy technique have been developed for measuring percentage of edible oil in French-style salad dressings. In imaging, one takes advantage of the variations in signal intensities related to differences in relaxation times of the oil and aqueous phases, and of the proportionality of projected frequencies to spatial distribution of sample constituents. In spectroscopy, percentage of oil is determined from standard curves where the integrals of oil/total spectra are correlated on known amounts of oil in standard preparations. Both procedures permit rapid, non-destructive analysis of commercially packaged dressings in unopened bottles with non-magnetic closures. Results obtained in imaging or by NMR spectroscopy were within plus or minus 2% of the expected values. AS

Root vegetables

Carrots

- 1878 Carline (F), Nguyen-The (C), Chambroy (Y) and Maryse Reich. Effects of controlled atmospheres on microbial spoilage, electrolyte leakage and sugar content of fresh ready-to-use' grated carrots. *International Journal of Food Science and Technology* 25(1); 1990; 110-119

The effects of controlled atm. (carbon dioxide concn. ranging from 0.03 to 40% and oxygen concn. ranging from 21 to 1%, measured in pack) were studied on fresh ready-to-use' grated carrots, stored at 10 C. High carbon dioxide or low oxygen conditions favoured the growth of lactic acid bacteria(LAB) on grated carrots, but not in a sterile carrot medium, and induce and increased K ion leakage. A 25% carbon dioxide and 2% oxygen atm. improves retention of sugar. Grated carrots were innoculated by a strain of *Leuconostoc mesenteroides*, which caused increased K ion leakage exudation only under an atm. containing 40% carbon dioxide and 10% oxygen. The origin of the spoilage of ready-to-use grated carrots is discussed. AS

Cassava

- 1879 Raja (KCM), Sukumaran (K) and Ram Mohan (TR). Studies on force-deformation properties of fresh cassava (*Manihot esculenta* Crantz). *Journal of Food Science and Technology (India)* 27(1); 1990; 65-67

Studies were carried out to understand the mechanical failure of fresh cassava tubers of 'Malayan-4(M-4)' var. Compressive load testing was done using Instron Universal Testing Machine (Model 1195). Studies showed that tubers develop visible crack when compressed upto 25% deformation. The energy dissipated at this level of compression was 9 and 11.5J in the case of whole and deskinnd tubers resp. AS

Tubers

Potatoes

- 1880 Joshi (MR), Srirangarajan (AN) and Thomas (P). Effects of gamma-irradiation and temperature on sugar and vitamin C changes in five Indian potato cultivars during storage. *Food Chemistry* 35(3); 1990; 209-216

The changes in sugar and vitamin C content of five potato cvs subjected to gamma-irradiation (100 GY) to cause sprout inhibition were compared with non-irradiated control tubers during storage at 27-32 C (ambient temp.) and 15 C, and also with control tubers stored at 2-4 C- the commercial cold storage temp. Reducing and non-reducing sugars increased during extended storage at all temp., the max. increase occurring at 2-4 C. The proportion of non-reducing sugar was higher at 27-32 C, whereas at 2-4 C reducing sugar formed the greater proportion. Irradiation did not influence the pattern of sugar accumulation. Irradiated potatoes stored at 15 C for 6 months has lower sugar levels than control tubers stored at

2-4 °C. During the first 2 months vitamin C levels were lower in irradiated potatoes stored at 15 °C than in the controls stored at 2-4 °C, but were subsequently higher. The suitability of tubers for processing into crisps and french fries was not affected by irradiation and storage at 15 °C for 6 months. AS

- 1881 Milanowski (J). Comparative simulation studies of energy consumption in potato storage. *Acta Alimentaria Polonica* 14(2); 1988; 131-138

Model applied in microcomputer simulation of potato storage are described, and possibilities of saving energy by selecting suitable control algorithms for ventilation are examined. AS

- 1882 Misra (JB) and Prem Chand. Relationship between potato tuber size and chemical composition. *Journal of Food Science and Technology (India)* 27(1); 1990; 63-64

Dry matter, reducing sugars, sucrose, total phenolics and ascorbic acid contents of potato tubers of varying sizes were determined for cvs 'Kufri Chandramukhi' and 'Kufri Sindhuri'. The values obtained showed linear negative relationship between tuber size and total phenolics and between tuber size and reducing sugars. Between the two cvs. the reducing sugars and total phenolics, irrespective of size, were more in the cv 'Kufri Sindhuri'. AS

- 1883 Rama (MV), Krishnamurthy (H) and Narasimham (P). Evaporative cooling storage of potatoes in two model storage structures. *Journal of Food Science and Technology (India)* 27(1); 1990; 19-21

Two model storage structures of evaporative cooling (EC) were designed, fabricated and their relative performance in curtailing wt. losses and sprouting during storage of potatoes was evaluated in June/July and October/November months. System I, is a metallic chamber without perforations of the evaporative surfaces for restricting ventilation, which maintains a RH of 90% plus or minus 5%, and system II is a weld mesh chamber (2.5 cm² mesh) with the evaporative sides covered with wet cloth to provide free movement of evaporatively cooled air, which maintains a RH of 85% plus or minus 5%. Both the systems reduced the physiological losses in wt. of potatoes during storage compared to those stored at ambient conditions (20-30 °C, RH 40-80%). However, the system I has recorded less physiological wt. loss than the system II. Both the systems maintained the temp. of air inside the EC closer to wet bulb temp. Storing potatoes pretreated with sodium salt of naphthalene acetic acid (NAA) containing fungicide, Benlate each at 1000 p.p.m. concn. in the EC containers has slightly

reduced sprouting compared to untreated tubers and eliminated spoilage. AS

- 1884 Rice (P), Selman (JD) and Abdul-Rezzak (RK). Nutrient loss in the hot water blanching of potatoes. *International Journal of Food Science and Technology* 25(1); 1990; 61-65

Potato Starch

- 1885 Leszczynski (W) and Golachowski (A). Comparison of potato starch gelatinization temperatures determined by different methods. *Acta Alimentaria Polonica* 14(38)(2); 1988; 123-130

The temp. of potato starch gelatinization were compared using four methods of detn. i.e. Brabender's viscograph, rotary viscosimeter, microscopic and conducting methods. The results of gelatinization temp. determined by the methods mentioned above were different. They showed correlation in each case excluding when the results of the final temp. were obtained using Brabender's viscograph. AS

Vegetables

- 1886 Magalhaes (MJA), Ferreira (JR), Frutuoso (L) and Tainha (AA). Study of the disappearance of endosulphan, parathion, trichlorfon and pirimicarb from broccoli and Portuguese cabbage. *Pesticide Science* 27(1); 1989; 23-31

The influence of surface of exposure of brassica to insecticide sprays has been assessed in two exp. conducted in small, plots where endosulfan, parathion, trichlorfon and pirimicarb were applied to a flowering brassica, broccoli (*Brassica oleracea* L. var *italica* Plenck) and to a leafy brassica (*Brassica oleracea* L. var. *trochuda* Bailey). The differences of surface exposure resulted in much higher deposits and subsequent residue levels in broccoli. The results stress the need to evaluate residue data on groups of Brassicas of different surfaces of exposure to pesticide spray when granting registration petitions for brassicas in general in order to establish pre-harvest intervals. AS

- 1887 Oszmianski (J) and Lee (CY). Inhibitory effect of phenolics on carotene bleaching in vegetables. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 688-690

Lipoxygenase is known to be involved in the indirect oxidation of carotene, and some phenolic compounds are known to prevent lipoxygenase activity. Inhibitory potencies of major phenolics in vegetables on carotene oxidation were studied by using both a model system and various vegetables. Catechin and epicatechin were the highest and p-caumaric and ferulic acids

were the lowest in inhibitory efficacy. In general, in a model system flavans showed the highest inhibitory effect followed by flavonols and acidic phenolic compounds. The concn. of phenolics in vegetables appeared to have a high correlation with the inhibitory effect on carotene bleaching, in general, but spinach, which contains the highest concn. of phenolics among vegetables studied, did not show the same level of inhibitory potencies. This may be due to the fact that spinach phenolics consist mainly of methylated flavones and p-coumaric derivatives, compounds that have low inhibitory effects. AS

Cauliflowers

- 1888 Jayaraman (KS), Das Gupta (DK) and Babu Rao (N). Effect of pretreatment with salt and sucrose on the quality and stability of dehydrated cauliflower. *International Journal of Food Science and Technology* 25(1); 1990; 47-60

Dehydrated cauliflower was prepared by soaking the blanched pieces in solutions of different concn. of common salt and sucrose (cane sugar), alone and in combination, prior to drying in a cabinet drier and evaluated for sensory, rehydration, storage, microbiological, histological and sorption characteristics. While sucrose alone produced considerable improvement, salt supplemented its effect. The optimum treatment was soaking in 3% salt and 6% sucrose for 12-16 h at 4 °C; it markedly reduced shrinkage and improved rehydration without affecting palatability. It was necessary to boil the soak solution for 3 min and cool prior to soaking to reduce microbial contamination. The treatment increased ascorbic acid loss by 8%. Monolayer moisture content calculated from BET equation was 6.5% (moisture-free) basis for treated and 5.3% for untreated. The treatment increased the shelf-life of the product from 3 to 12 months at ambient temp. when packaged in paper foil-polythene laminate. AS

Cleome

- 1889 Mnzava (NA). Studies on tropical vegetables. Part 2. Amino and fatty acid composition in seed of cleome (*Gynandropsis gynandra* L. Briq) selections from Zambia. *Food Chemistry* 35(4); 1990; 287-293

Seed of cleome (*Gynandropsis gynandra* L. Briq) contained 29.5% crude protein and 27.7% lipid. The highest values of crude protein (31.4%) and lipid (29.6%) were found in 'Purple Stem' 'Green Stem' had the lowest values of 27.9% protein and 25.1% lipid. Oleic and linoleic acids accounted for 80.7% of the total fatty acids in which linoleic acid was most abundant (58.93%). The high degree of unsaturation is manifest in the high iodine and saponification numbers (123 and 192 resp.) of

the oil. Cultigens exhibited slight variation in the proportions of fatty acids and had generally lower stearic (6.55%) than palmitic acid (11.2%). Arachidic and eicosenoic acids occurred in least proportions. Amino acid analysis of defatted meal revealed the abundance of glutamic acid, arginine and aspartic acid in which 'NIRS-2' and NIRS-3' had relatively higher values. Lysine, tyrosine and histidine were the lowest. The amino acid profile is comparable to that in leguminous oil seeds. AS

Cucumbers

- 1890 Howard (LR) and Buescher (RW). Cell wall characteristics and firmness of fresh pack cucumber pickles affected by pasteurization and calcium chloride. *Journal of Food Biochemistry* 14(1); 1990; 31-43

Changes in cell wall pectic substance, degree of pectin methylation, bound Ca^{++} , neutral sugar comp., and firmness were determined in mesocarp tissue of pasteurised and non-pasteurized fresh pack cucumber pickles. Large changes in solubility characteristics of pectic substances occurred in cell walls of non-pasteurized pickles that were attenuated by pasteurization. In particular, water and alkali soluble pectins declined, and non-extractable pectins increased during the first month of storage. The major changes in pectic substance solubility appeared to be related to reduction in the degree of pectin methylation with a minor influence of CaCl_2 . Galactose in cell walls of non-pasteurized pickles was substantially reduced, and the reduction in galactose was hindered by CaCl_2 or pasteurization. The amount of bound Ca^{++} appeared to be associated with tissue firmness after one month in storage, since firmer tissue had more cell wall bound Ca^{++} . While firmness was associated with the amount of bound Ca^{++} , the amount of bound Ca^{++} was dependent on the supply of Ca^{++} and the degree of pectin methylation. AS

Leafy vegetables

Alfalfa

- 1891 Baraniak (B) and Baraniak (A). Chromatographic separation of soluble proteins obtained in alfalfa juice fractionation. *Acta Alimentaria Polonica* 14(2); 1988; 225-229

The chloroplastic fraction of green alfalfa juice was separated by centrifugation, heating the juice to 333 K, or application of the polyelectrolytes Magnafloc LT-27 and M-22S. The cytoplasmatic fraction was precipitated by heat (358 K) or acid coagulation (pH = 3.5). The supernatants after chloro- and cytoplasmatic fraction separation (chloroplast free juice

and whey) were chromatographed on a Sephadex G-100 column. AS

Amaranthus

- 1892 Balasubramanian (T) and Sadasivam (S). Changes in carbohydrate and nitrogenous components and amylase activities during germination of grain amaranth. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 325-330

This study reports the changes in certain enzyme (alpha- and beta-amylase) activities and biochemical components (starch, sugar, protein and lysine) during germination. Grain amaranth (*Amaranthus hypochondriacus*, Yercaud local var.) was soaked overnight and germinated for 192 h taking the soaked grain as the zero time (0h) sample. Activity of alpha-amylase was high in the 0h soaked grain, while beta-amylase activity was high in 72 h germinated grains. The joint action of the amylases resulted in a decrease of starch content from 0 to 192 h in germinated grains and an increase in total sugars during the initial period of germination. Protein nitrogen was found to decrease from 48 h to 192 h accompanied by an increase in free amino acid and non-protein N contents. Total lysine content was found to be increased by 31% in 24 h germinated grain amaranth. Protein fractionation of raw, soaked and 24 h germinated grain amaranth showed that the distribution of different types of proteins varied during germination of the grains. An increase of water soluble content was noticed in 24 h germinated grains. SRA

- 1893 Tovar (LR), Brito (E), Takahashi (T), Miyazawa (T), Soviano (J) and Fujimoto (K). Dry heat popping of amaranth seed might damage some of its essential amino acids. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 299-309

The purpose of this study was to monitor by chem. and biological assays any nutritional changes that the popped amaranth seed (*Amaranthus cruentus*, *A. hypochondriacus*) might have suffered by the heat treatment either by the fluid bed system (FBS) or the traditional method (TM). The data from animal exp. were analysed statistically and results have shown that (a) Lys, Arg, and Cys were damaged in the heat treated seeds, (b), Asp, Met, Glu, Ala, and Phe were recemized in that decreasing order in the seeds popped and roasted by TM; (C) the estimated net protein retention (NPR) and estimated net protein utilisation (NPU) of popped amaranthus by either method were not different from casein; (d) Leu was not the most limiting amino acid in any of the amaranth seeds tested. After Lys, sulphur amino acids appear to be the next most limiting in severely heat treated amaranth. The FBS seems to be a promising method for popping amaranth at industrial level. SRA

Lettuces

- 1894 Beuchat (LR) and Brackett (RE). Survival and growth of *Listeria monocytogenes* on lettuce as influenced by shredding, chlorine treatment, modified atmosphere packaging and temp. *Journal of Food Science* 55(3); 1990; 755-758, 870

The effects of shredding, chlorine treatment and modified atm. packaging on survival and growth of *Listeria monocytogenes*, mesophilic aerobes, psychrotrophs and yeasts and moulds of lettuce stored at 5 and 10 C were determined. With the exception of shredded lettuce which had not been chlorine treated, no significant changes in populations of *L. monocytogenes* were detected during the first 8 days of incubation at 5 C; significant increases occurred between 8 and 15 days. Significant increases occurred within 3 days when lettuce was stored at 10 C, after 10 days, populations reached 10^8 - 10^9 CFU/g. Chlorine treatment, modified atm. (3% oxygen 97% nitrogen) and shredding did not influence growth of *L. monocytogenes*. It was concluded that *L. monocytogenes* is capable of growing on lettuce subjected to commonly used packaging and distribution procedures used in the food industry. AS

Spinach

- 1895 Hisaka (H). A relation of change in appearance to changes in sugar content and respiration rate in Spinach during storage. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 956-963 (Ja).

Spinach (*Spinacia oleracea* L. cv. Read) leaves cultivated at open-field and a green house were stored at 0, 10, 20, and 30 Degree C in the dark. The changes in respiration rate, sugar contents and appearance during storage at various temp. were compared. (1) the sugar content of open-field grown spinach was two times higher than that of green house grown spinach. The sugar content of spinach petiole was four times higher than that of spinach leaf blade (2) the respiration rates of open-field grown spinach were 630 (carbon dioxide mg/kg./h), 280, 123 and 42 mg when stored at 0, 10, 20 and 30 C in dark resp. The respiration rates of green house spinach were 343 (carbon dioxide mg/kg.h). 163, 68 and 26 mg resp. The respiration rates of open-field grown spinach was 1.6 - 1.8 times higher than that of green house grown spinach. (3) the sugar content of outer leaves of spinach decreased with increasing storage temp. Decrease of sugar contents in outer leaves during storage was distinctly faster than that in inner leaves. (4) when spinach leaves were not yellowing, the ratio of measured sugar decrease to estimated sugar decrease from respiration was about 0.9 however, it decreased about 0.4 when spinach leaves

were yellowing. (5) Yellowing of spinach leaves started when the sugar content of the outer leaves dropped to 0.06-0.05 (g/100 g f.w.). The yellowing decreased the quality of bundled spinach. (6) The sugar content of open-field grown spinach was higher than that of green house grown spinach. Respiration rate of spinach leaves cultivated at open-field were also higher than that cultivated at the green house. There was little differences in shelf-life between open-field grown and green house grown spinach leaves. AS

Tomatoes

- 1896 Casas (JL), del Rio (JA), Serrano (M) and Acosta (M). Comparison of four methods for the extraction and quantification of 1-aminocyclopropane-1-carboxylic acid (ACC) in tomato fruits. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 191-198 (Es).

Four methods for extracting 1-aminocyclopropane-1-carboxylic acid (ACC), all of them allowing a rapid treatment of the samples, have been compared using tomato fruits as plant material. The extracting agents were: water, trichloroacetic acid, perchloric acid and methanol. The four procedures were appropriate for the detn. of ACC but the extraction with trichloroacetic acid provided the best results in terms of extract stability: less than 1% loss after 24 h at -20 C. The efficiency of the conversion of ACC to ethylene was improved up to 75%. One h was the min. time needed to cause the total hydrolysis of conjugated ACC. The quantification of total ACC in green-rosy tomato fruits (*Lycopersicon esculentum* Mill, cv. B-354) obtained under these conditions, was 10.5 plus or minus 0.2 mol/g fresh wt. (fw), corresponding 7.3 plus or minus 0.1 nmol/g fw to conjugated ACC and 3.2 plus or minus 0.1 nmol/g fw to free ACC. This last estimation was confirmed with the linear regression method, adding increasing amounts of internal standard to a fixed vol. of sample. AS

Tomato pastes

- 1897 Buttery (RG), Teranishi (R), Flath (RA) and Ling (LC). Identification of additional tomato paste volatiles. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 792-795

Twenty one additional volatile aroma compounds were identified in tomato paste that had not previously been reported as tomato components. The most potent odourants of these are dimethyl trisulphide and 1-octen-3-one. Additional ionone-related compounds were found of which 1,1,6-trimethyl-1,2-dihydronaphthalene, 1,1,6-trimethyl-1,2,3,4-tetrahydronaphthalene, alpha-cyclocitral, and 2,2,6-trimethyl-5-cyclohexenone were identified with some certainty; others

including four tetramethylbicyclononatrienes were tentatively identified. The pattern of ionone-related compounds in tomato paste resembles that already known in some fruits, and a similar origin, from glycoside hydrolysis, seems likely. Other usual compounds identified include 1-(methylthio) pentan-3-one, 1-(methylthio)octan-3-one, 3-(methylthio)hexanal, 1-nitro-2-methylpropane, and hortrienol. AS

FRUITS

- 1898 Castaldo (D), Quagliolo (L), Balestrieri (C) and Serillo (L). Purification of the enzyme pectinmethyl esterase by affinity chromatography on heparin sepharose. *Industria Conserve* 64(2); 1989; 114-116 (It).

A quick and efficient method for purifying the enzyme pectinmethylesterase by affinity chromatography on sepharose bound heparin is described. The method was applied to pectinmethylesterase from apple, kiwifruit, orange and tomato. In all cases good yields of a high-purity enzyme preparation were obtained. AS

- 1899 Gherardi (S), Bolzoni (L), Careri (M), Rognoni (U) and Trifiro (A). Possibilities of applications of membrane processes in the technology of fruit purees. *Industria Conserve* 64(2); 1989; 93-101 (It).

The possibility of using combined ultrafiltration reverse osmosis for the production of high-quality concentrated fruit purees was investigated. Ultrafiltration allows a perfect separation of clear serum from the pulp. Depending on the amount of serum removed, a product more or less rich in pulp is obtained which can be further processed into high-fibre dietetic foods, powders, yoghurt, ice-creams and mousses. The ultrafiltered serum is bright in colour and its flavour is typical of the original fruit. Since it comes out of the membranes sterile, it can be used without any subsequent stabilising heat treatment, with remarkable advantages as regards quality. Serum concn. by reverse osmosis allows a 25-27 Degree Brix clear liquid to be obtained which can be used as such or mixed with the corresponding pulp for the production of a 16-18 C Brix puree with good sensory characteristics. AS

- 1900 Splittstoesser (DF) and Churey (JJ). Effect of low concentrations of sorbic acid on the heat resistance and viable recovery of *Neosartorya fischeri* ascospores. *Journal of Food Protection* 52(11); 1989; 821-822

Concn. of sorbic acid as high as 1000 mg/L had little

effect on the heat resistance of ascospores. Growth of surviving spores that had been exposed to a lethal temp., however, was greatly inhibited by concn. as low as 70 mg/L. The results suggest that spoilage of thermally processed fruit products can be prevented by the incorporation of low amounts of sorbic acid. AS

Apples

- 1901 Hollborn (E), Wald (B), Galensa (R) and Herrmann (K). Detection of apple ingredients in foods by HPLC and solid phase extraction. *Deutsche Lebensmittel-Rundschau* 86(1); 1990; 1-3 (De).

Sorbitol is not always a suitable indicator to detect addition of apples to food. Therefore a method is described using the dihydrochalcones phloretin glucoside and phloretin xyloglucoside which are specific compounds of apples. The detection is carried out by HPLC on RP-18 column and UV detection. To verify the results a diode array detector is used. A clean up procedure by solid phase extraction has been developed. Good results have been received with phenyl- and polyamide cartridges. AS

- 1902 Langeloh (G), Petz (M) and Schulte (E). Identification of shellac and carnauba wax on apples by GC. *Deutsche Lebensmittel-Rundschau* 86(1); 1990; 4-6

A GC method is described using a fused silica capillary column for the identification of apples coated with shellac or carnauba wax. The identification of shellac wax is possible after saponification and silylation of the isolated wax through a typical fingerprint pattern and a compound eluting between the alkane C₂₆ and C₂₇. Carnauba wax can be identified without derivatization using high-temp. GC. The characteristic components are the C₃₁ alkane and several compounds eluting in the range of the alkanes C₄₈-C₆₀. AS

- 1903 Yuen (CMC), Wills (RB), H) and Scott (KJ). Effect of phorone on accumulation and fatty acid composition of surface lipid of apple during storage. *Journal of Food Biochemistry* 14(2); 1990; 153-159

Phorone added to apples after harvest stimulated the rate of accumulation of surface lipid and decreased the rate of water loss when fruit were stored at 0 °C but had the opposite effect in fruit stored at 5, 10 or 20 °C where lipid accumulation was inhibited and water loss enhanced. The fatty acid comp. of surface lipid from phorone-treated fruit showed a higher proportion of linoleic acid at all temp. For oleic and linolenic acids, a differential effect of storage temp.

occurred with phorone-treated fruit at 0 °C developing a lower proportion of oleic acid and a higher proportion of linolenic acid compared to control fruit whereas at 5 °C and 20 °C the reverse occurred. AS

Apricots

- 1904 Guichard (E), Schlich (P) and Issanchou (S). Composition of apricot aroma. Correlations between sensory and instrumental data. *Journal of Food Science* 55(3); 1990; 735-738

Volatile compounds of six apricot cvs were isolated by vacuum distillation and separated by gas chromatography. Eleven aromatic compounds were selected by sniffing and quantified after addition of known amounts of pure compounds. Sensory analyses were performed to rate the typicality of apricot aroma in these cvs. Since the chem. extracts were not assessed significantly different from the raw product, statistical analyses were performed to correlate the typical sensory notes with the instrumental data. A correspondence analysis showed that cvs could be separated into three clusters, according to their typical aroma. Hexyl acetate, gamma-octalactone and gamma-decalactone were shown to be key compounds for the apricot flavour whereas benzaldehyde could have a negative impact on the aroma of the less aromatic cvs but would favourably complete the typical aroma of "Rouge du Roussillon". AS

Ber

- 1905 Syamal (MM) and Rajput (CBS). Effect of pruning on growth, fruiting and fruit quality of ber (*Zizyphus mauritiana* Lam.). *Indian Journal of Horticulture* 46(3); 1989; 364-367

Ber trees were pruned to different severity levels by removal of all woods except (i) 20, (ii) 40 and (iii) 60 cm length of shoot and no pruning served was control. Fruit set and retention of fruits decreased and the wt. and size of fruits increased significantly as the pruning intensity increased from 60 to 20 cm retention of shoot. Light pruning trees (60 and 40 cm retention), gave more fruit yields. The quality of fruits improved due to pruning; total soluble solids content was max. (17.30%) in fruits from severely pruned trees (20 cm retention). Max (0.37%) acidity of fruit was in control trees and min. (0.32%) in severely pruned trees. Vitamin C content was max. (108.35 mg/100 g pulp) in fruits from severely pruned trees. KAR

Breadfruits

- 1906 Omobuwajo (TO) and Wilcox (BF). Microbes associated with field

spoilage of breadfruit (*Artocarpus communis*). *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 175-178

A major factor against realization of the potential of breadfruit as a staple food in most tropical countries is spoilage during fruit development. Work on spoilage of breadfruit in the Nigerian forest areas is reported here for the first time. Microbes isolated were mainly fungal plant pathogens of the genera *Aspergillus*, *Mucor*, *Rhizopus*, and bacteria of the genus *Staphylococcus*. A mechanism of infection is proposed following microscopic examination of the fruit epidermis. Fumigation of the trees with a suitable fungicide at the onset of flowering and shortly after the emergence of the fruit is recommended as a control measure against this spoilage. The prevention of this spoilage has the potential of ameliorating the problems associated with food scarcity and starvation in many of the tropical countries where breadfruit is a veritable staple. AS

Citrus

- 1907 Casas (A) and Llacer (J). The colour of citrus fruits. III. Colour changes induced by pre-harvest treatments. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 173-190 (Es).

In this third part of the review paper on colour of citrus fruits and the influence of several factors (Rev. Agroquim. Tecnol. Aliment., 28/2 (1988), 184-202, and 28/3 (1988), 344-356), colour changes originated by different pre-harvest treatments are discussed. Effects of the application of gibberellic acid, ethrel, figaron and other growth regulators are described. AS

- 1908 Parish (ME) and Higgins (DP). Yeasts and molds isolated from spoiling citrus products and by-products. *Journal of Food Protection* 52(4); 1989; 261-263

A var. of citrus products, including dried peel used as livestock fodder, unpasteurized orange juice and pasteurized, and chilled orange juice were selectively surveyed for their fungal microflora. Fungi isolated were (1) pasteurized orange juice: *Aureobasidium pullulans*, *Cladosporium* sp., and *Penicillium* sp. (2) unpasteurized orange juice: *Candida maltosa*, *C. sake*, *Fusarium* sp., *Geotrichum* sp., *Hanseniaspora* sp., *H. guilliermondii*, *Penicillium* sp. *Pichia membranaefaciens*, *Saccharomyces cerevisiae*, *Schwanniomyces occidentalis*. and *Torulaspora delbrueckii* and (3) dried peel: *Aspergillus niger*, *Aspergillus* sp. *Byssoschlamys* sp., *Fusarium* sp. *Penicillium* sp. *Rhizopus* sp. *Rhodotorula* sp., *Schw. occidentalis* and *Trichoderma* sp. AS

Grapefruits

- 1909 Wilson III (CW), Shaw (PE), McDonald (RE), Greany (PD) and Yokoyama (H). Effect of gibberellic acid and 2-(3,4-Dichlorophenoxy) triethylamine of nootkatone in grapefruit peel oil and total peel oil content. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 656-659

The nootkatone content in grapefruit peel oil extracted from flavedo and the peel oil content of fruit receiving preharvest treatment with 20 or 50 p.p.m. gibberellic acid (GA) and/or 50, 125, 250 p.p.m. 2-(3,4-dichlorophenoxy) triethylamine (DCPTA) were determined. Treatment by GA reduced the rate of increase in nootkatone concn. observed in control fruit with maturation, and the effect was dose-dependent. When DCPTA was used alone as the growth regulator, nootkatone content increased significantly. When 50 p.p.m. GA followed DCPTA treatment at the three levels used above, the effect of GA predominated and nootkatone content was significantly lower than that found in untreated fruit. Treatment by GA generally increased peel oil concn. AS

Grapes

- 1910 Ekanayake (A), Steven Smith (R) and Nelson (PE). Improved diazotization-coupling technique for analysis of methyl anthranilate in grape products. *Journal of Food Science* 55(3); 1990; 877-878

Methyl anthranilate was determined in grape products by diazotizing with 1M HCl and 1% sodium nitrite and coupling the diazonium salt with N-1-naphthylethylenediamine dihydrochloride in situ. The chromophore which formed had an extinction coeff. of 42,000 mole⁻¹ L cm⁻¹ and colour formation correlated with concn. in accordance with Beer's Law up to about 100 g methyl anthranilate. Grape essence samples with 3 to 124 g ML⁻¹ methyl anthranilate were used to evaluate the method against a gas chromatographic technique. The correlation coeff. was > 0.99 between the two methods. Compared with existing methods, this new method has the advantage of not requiring stringent reaction times or conditions. AS

Guavas

- 1911 Vijay Laxmi Majumdar and Pathak (VN). Changes in nutritional value of guava fruits infected by major post-harvest pathogens *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 311-315

This investigation was conducted for finding out biochemical changes altering the nutritional status of the fruits due to infection by major fruit rot pathogens. In this study fruits infected by the five pathogens (*Colletotrichum gloeosporioides*, *Botryodiplodia theobromae*, *Rhizopus arrhizus*, *Phomopsis psidii*, *Pestalotiopsis versicolor*). Contents of ascorbic acid, sugars and proteins declined in the fruits infected by *Botryodiplodia theobromae*, *Colletotrichum gloeosporioides*, *Pestalotiopsis versicolor*, *Phomopsis psidii*, and *Rhizopus arrhizus*. Total phenols increased in fruits infected by *Pestalotiopsis versicolor* and *Rhizopus arrhizus* while reverse was observed in fruits infected by the pathogens. SRA

Oranges

- 1912 Stug (E), Swaczyna (H) and Speer (K). Mass spectrometric investigation into off-flavours in an orange nectar and a fish marinade. *Deutsche Lebensmittel-Rundschau* 86(1); 1990; 6-9 (De).

The mass spectrometric of orange nectar and fish marinades indicated that the halogenated phenols caused iodoform-like phenolic off-flavours. The investigation also discusses the identification and supportive affirmation. BV

- 1913 Tafazoli (E), Saffarian (A) and Rastegar (H). Yield and quality of Valencia orange as affected by gibberellic acid. *Indian Journal of Horticulture* 46(3); 1989; 319-321

Valencia orange trees (*Citrus sinensis*) were sprayed with 0, 50 and 100 p.p.m. gibberellic acid (GA) at pre-bloom (about a month before flowering), full-bloom and post-bloom (two weeks after full bloom) and the yield, wt., total soluble solids, pH and acidity of fruits were estimated. Yields was significantly reduced with all concn. and times of application of GA. Average fruit wt. was increased markedly at both levels but highest increase was observed with 100 p.p.m. applied at pre-bloom stage. Vitamin C content of juice was not altered by application time or concn. of GA, but total soluble solids content and pH increased slightly. KAR

Peaches

- 1914 Robertson (JA), Meredith (FI), Horvat (RJ) and Senter (SD). Effect of cold storage and maturity on the physical and chemical characteristics and volatile constituents of peaches (Cv. Cresthaven). *Journal of Agricultural and Food Chemistry* 38(3); 1990; 620-624

The effects of cold storage and maturity on the physical and chem. characteristics and volatile flavour constituents of

peaches (cv. Cresthaven) were determined. In general size, wt., soluble solids (SS), sucrose content, SS/(titratable acidity) ratio, volatiles, and Minolta alpha- value increased with increased maturity of unripened fruit. Minolta L and b values, glucose, fructose, and sorbitol contents, and total phenolics did not vary significantly by maturity. Titratable acidity and hue angle decreased significantly with increased maturity. The wt. of the peaches of all maturity grades decreased significantly during storage at 0 C with an average decrease of about 3.5%/wk. During cold storage, Cresthaven peaches also underwent significant decreases in hue angle, sucrose content, and titratable acidity (TA) and significant increases in glucose and fructose contents and SS/TA ratios. The volatiles generally decreased during storage. Data indicate that cv. Cresthaven peaches of the three maturity grades evaluated will hold up under 0 C storage for about 4 wks. After 4 wks storage, significant deterioration probably will occur. AS

Sapota

- 1915 Gautam (SK) and Chundawati (BS). Postharvest changes in sapota cv. 'Kalipatti'. I. Effect of various postharvest treatments on biochemical changes. *Indian Journal of Horticulture* 46(3); 1989; 310-315

Harvested sapota (*Achras sapota*) was treated with 300 p.p.m. of gibberellic acid for 20 min. (T_1), kinetin 100 p.p.m. dip for 20 min. (T_2), silver nitrate 40 p.p.m. dip for 20 min (T_3); all the treated fruits were ripened at ambient (28.2 - 39.2 C) conditions with RH between 72 - 100%. All the treatments retarded the relative activities of catalase and pectin methyl esterase and advanced their peaks by 2 days compared to control. Respiratory activity declined by these treatments upto 24 h which persisted upto 48 h in T_2 (kinetin) and T_3 (silver nitrate) treatments. The peak respiratory activity was delayed by one day in treated fruits. The level of ethylene production was max. in untreated control and in all the treatments it reached its peak at 144 h followed by a decline. Thus all the treatments helped in extending the shelf-life of sapota fruits. KAR

Strawberries

- 1916 Wesche-Ebeling (P) and Montgomery (MW). Strawberry polyphenoloxidase. Its role in anthocyanin degradation. *Journal of Food Science* 55(3); 1990; 731-734, 745

Two purified fractions of strawberry polyphenoloxidase (PPO) were used in model systems containing D-catechin alone or in combination with either pelargonin or cyanin. Km values

using D-catechin were 0.5mM and 0.41 mM and Vmax 82,700 and 18,800 nmoles oxygen/min/mg protein, resp., for each isozyme. Reaction of PPO with D-catechin led to the formation of yellow-brown pigments with max. absorbance at 390 nm. Little PPO activity could be detected using cyanin as a substrate and no activity with pelargonin. PPO and D-catechin together caused the loss of 50 to 60% of the anthocyanin pigments after 24 h at room temp. with the formation of a precipitate. AS

CONFECTIONERY, STARCH AND SUGAR

- 1917 Turecek (PL), Pittner (F) and Birkner (F). Degradation of polysaccharides by immobilized depolymerizing enzymes. *International Journal of Food Science and Technology* 25(1); 1990; 1-8

Polysaccharides in fruit and vegetable juices can be efficiently degraded using co-immobilized amylolytic and pectolytic enzymes combined with naringinase. The enzymes were immobilized on silica carriers for use in fining procedures to remove cloudiness. AS

Honeys

- 1918 Barbina (MT), De Paoli (M) and Valentio (A). Determination of tau-fluvalinate residues in honey. *Pesticide Science* 28(2); 1990; 197-202

A capillary column gas chromatographic method is described for the detn. of tau-fluvalinate in honey samples. The method involves solid phase extraction of the sample with two RP-C-8 cartridge in series, purification of the extract, if necessary, on a silica cartridge, and detection of the active ingredient with an electron capture detector. The method is rapid and overcomes the problem of emulsion formation in liquid/liquid partition often found in traditional systems. The detection limit in actual samples is 0.01 Mg kg^{-1} and mean recoveries for fortified samples prepared with or without clean-up are greater than 85%. AS

Sugar

- 1919 Rabindra (B), Swamy Gowda (SN) and Honnegowda). Effect of continuous use of nitrogenous fertilizers and soil physico-chemical properties, yield and juice quality of sugarcane. *Indian Sugar* 39(1); 1990; 843-845

Sugarcane crop was fertilized with 250 kg N either through urea for ammonium sulphate, or NPK at 25:100:125 kg/ha either

alone or with farm yard manure of 25 t or grown without fertilizer. Glucose content increased and sucrose decreased in no fertilizer no manure applied fields. Quality of juice was poor when N alone was applied continuously, but favourably improved when farm yard manure was added along with N. KAR

BAKERY PRODUCTS

- 1920 Hansen (A), Lund (B) and Lewis (MJ). Flavour production and acidification of sourdoughs in relation to starter culture and fermentation temperature. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 145-149

Three heterofermentative and two homofermentative lactic acid bacteria were used as starter cultures of semi-fluid rye wholemeal sourdoughs produced at 25, 30, 35, and 40 C in a lab. fermenter. The production of acids and volatile compounds in the sourdoughs was investigated. The fastest increase in acidity was generally seen at 35 C with stable acidification levels reached after 16-20 h of fermentation. Of the 10 alcohols, 10 esters and 6 carbonyls identified in the sourdoughs, ethyl acetate, 2-methyl-1-propanol, 2 3-methyl-1-butanol, ethyl n-hexanoate and diacetyl varied considerably with starter culture and/or fermentation temp. used. AS

- 1921 Lund (B), Hansen (A) and Lewis (MJ). The influence of dough yield on acidification and production of volatiles in sourdoughs. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 150-153

Four heterofermentative and three homofermentative lactic acid bacteria were used as starter cultures for semi-fluid and firm rye wholemeal sourdoughs fermented at 30 C, the production of acids and volatile compounds in the sourdoughs being investigated. Acid production per gram meal was highest in the semi-fluid sourdoughs and in heterofermentative cultures. Of the 12 alcohols, 10 esters and 12 carbonyls identified, the greatest differences in the content of volatiles could be seen between the semi-fluid and the firm sourdoughs, though differences were also observed between the various starter cultures used-especially if they were homo- or heterofermentative cultures. AS

Biscuits

- 1922 Ishida (K-I) and Nagasaki (M). Use of proteases in biscuit processing. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 964-967 (Ja).

Bread

- 1923 Collar (C), Prieto (JA), Mascaros (AF) and Benedito de Barber (C). Chemical changes during bread-dough fermentation. XI. Soluble amino acids, peptides and proteins from doughs prepared with a pure culture of *Saccharomyces cerevisiae*. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 266-280 (Es).

The trend, extent and rate of the changes during wheat bread fermentation have been investigated in 0.85 M NaCl soluble nitrogen fraction (SN), non protein (NPSN) - amino acids and peptides- and protein compounds (PSN) polypeptides and proteins fractionated by picric acid precipitation and purified by ion exchange chromatography, from unfermented, 2 h and 4 h, fermented bread doughs elaborated with a pure culture of *Saccharomyces cerevisiae*. Process has been followed by determining total solids, total nitrogen, primary amine nitrogen and alpha-amino nitrogen of free amino acid contents in total soluble fraction (SN) and NPSN and PSN purified subfractions, and by densitometer tracings performance of the protein subunits in SN. Estimated content of free amino acids decreased sharply only between 2 and 4 h of fermentation whereas low mol. wt. peptides underwent more gradual depletion. Total estimated polypeptide and protein contents did not changes along the fermentation whereas polypeptide:protein ratio increased significantly due mainly to the changes undergone by 14,000, 35,000, 65,000 and 67,000 daltons protein subunits. AS

- 1924 Hansen (A), Lund (B) and Lewis (MJ). Flavour of sourdough rye bread crumb. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 141-144

The flavour compounds in rye bread crumbs made from sourdoughs fermented with starter cultures (three heterofermentative and two homofermentative) have been compared with those in rye bread chemically acidified with lactic acid and lactic/acetic acid. Headspace/extraction-GC-MS analysis was used to quantify 42 compounds and to identify traces of a further 20 compounds. Sensory evaluation of sourdough rye bread crumbs that the most intense and bread-like flavour was associated with the highest content of 2-propanone, 3-methyl-1-butanal, benzylalcohol and 2-phenylethanol. The iso-alcohols, 2-methyl-1-propanol and 2-3-methyl-1-butanol, were found in high amounts in rye breads fermented with homofermentative cultures. Compounds with a buttery odour, 2,3-butanedione and 3-hydroxy-2-butanone, were produced most in rye bread acidified chemically or with a homofermentative culture. Differences were also observed in amounts of 2-furfural, gamma-

butyrolactone and furfuryl alcohol. The acids, except for acetic and heptanoic acid, showed little variation. AS

- 1925 Iskander (FT), Davis (KR), Ashour (H) and Hassan (HF). Aluminium content of Egyptian breads. *Food Chemistry* 35(3); 1990; 197-208

Bread, flour, bran and other breadmaking ingredients were collected from 13 villages in Egypt during September-December 1984. The Al content, as measured by instrumental neutron activation analysis, ranged from 18.1 to 224 g/g of bread in fellahi from Edfina on the Mediterranean coast and bettaw from Beni Suef, about 90 miles south of the capital Cairo, resp. Al in the ingredients ranged from 16.9 g/g in white wheat bran to 91.4 g/g in corn bran. Some trends were noted but not statistically tested. In general, the aluminium content of the bread seemed to be higher the further south the village was located. Corn-containing breads had higher levels of Al than wheat-based breads. The use of dung as a fuel for bread baking was associated with higher levels of Al in the bread. Daily intake of Al from bread in Egypt is 5 to 20 times greater than the estimated av. daily intake from common American diets. AS

- 1926 Martinez-Anaya (MA), Benedito de Barber (C), Ramon (T), Aguilar (F) and Contreras (M). Evaluation of the quality of typical bread products. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 246-254 (Es).

Several typical Spanish breads(B) and sweet baked goods (SBG) have been investigated for: a) sensory attributes, b) quality weighting factors; c) chem. comp., and d) caloric value. Eatability and typical flavour were major weighting factors in overall quality. Fat and dietary fibre were the most variable chemical compounds for B, and fat, protein and sugars for SBG. Caloric values ranged between 380 (B) and 500 (SBG) Kcal/100g d.b. AS

MILK AND DAIRY PRODUCTS

- 1927 Hegazi (FZ) and Abo-Elnaga (IG). Acetoin and diacetyl production by lactic acid bacteria from citrate and pyruvate. *Deutsche Lebensmittel-Rundschau* 85(10); 1989; 322-324

Some starter cultures, lactic streptococci and lactobacilli were examined for their ability to produce acetoin (A) and diacetyl (D) in 9% reconstituted skim milk exogenously supplied with either citrate or pyruvate and in peptone-yeast extract-glucose broth (PYG) containing pyruvate. The largest amount of A plus D was produced from citrate and by the citrate

fermenters *S. cremoris*. AM₂ *L. casei* ATCC 393, *L. casei* subsp *alactosus* and *L. xylosus*. Production of diacetyl was strongly affected by the sp. and strain of lactic acid bacteria, substrate and culture medium,. Citrate was found to be much more preferable to pyruvate for addition to milk intended for cheese-making and manufacturing cultured dairy products to intensify the diacetyl production. In such milk the highest formation of diacetyl was by the citrate fermenter *L. casei* ATCC 393, *S. faecalis*. *S. cremoris*. AM₂, some strains of *L. casei*, some strains of *L. plantarum* and *L. helveticus* were the next in the order of production all forming a similar quantity. Organisms of this type would, therefore, be expected to greatly influence cheese flavour and aroma developed if they were originally involved in cheese processing and ripening. Pyruvate metabolized by lactobacilli in PYG broth gave the biggest amount of diacetyl ever observed in these experiments. Because of their high efficiency conversion of pyruvate to diacetyl (mmol diacetyl formed/M mol pyruvate utilized), their insensitivity to bacteriophage attack and their tolerance to low pH, heat and salt, lactobacilli are suitable for use in biotechnological processes and diacetyl production, particularly since they are safe for food use. By culturing in an artificial medium under controlled conditions, diacetyl and acetoin synthesis from pyruvate could be increased. AS

- 1928 Mathur (BN). Prospects for biotechnological applications in dairy processing industry for enhanced productivity. *Indian Dairyman* 42(3); 1990; 101-106

In this review issues involved in upgrading of technology and prospects for biotechnological applications to enhance productivity in dairy industry are mentioned. Biotechnological applications in dairy processing covers aspects like cheese and milk products; high-fructose spray dried whey; special fermented milk foods like microbial polysaccharides, production of anticholestermic and anticarcinogenic factors; and infant formulae with enhanced bioprotective attributes. Also suggests for newer biotechnological approaches for the manufacture of fermented milks with the introduction of dialysis bioreactors and development of new fermenting strains through genetic manipulations. 4 references. SRA

- 1929 Mohamed Habibullah Khan (M) and Narasimhan (R). Role of diacetyl on the shelf-life of pasteurised cream. *Indian Dairyman* 42(4); 1990; 209-210

Pasteurised cream (lab. prepared and market sample) were stored at 5 C till use. One lot of market cream was added with diacetyl. Initial microbial load was assessed in all samples. The shelf-life of market cream samples in control was 6 days and diacetyl treated sample was 16 days. However, when

the samples were stored at 5 °C the counts were low ($P < 0.01$). In the lab. cream samples the keeping quality was highest (18 days) which showed lowest counts. Post pasteurisation contamination of pasteurised cream could not be avoided; addition of diacetyl at 10 p.p.m. would be the choice preservative for extending the shelf-life of cream. SRA

- 1930 Mokashi (NG). Technological innovations in packing of dairy products. *Indian Dairyman* 42(3); 1990; 121-123

Packaging requirements to protect milk from dirt, bacteria, light and oxygen are mentioned. The article briefly mentions the innovations taken place in packing materials, packing forms and package forms used in packing dairy products. SRA

- 1931 Sadasivam (V). Energy management in dairy plants. *Indian Dairyman* 42(3); 1990; 124-126

Studies conducted in nine dairy plants by National Productivity Council (NPC) of India has identified several energy conservation possibilities. The points which have been elaborated include steam generation efficiency improvement, installation of economiser for waste heat recovery, replacing inefficient coal crusher and coal fired boiler, condensate recovery and reuse as hot water, selection and maintenance of steam traps, flash steam generation, replacing steam jet ejector by vacuum pump, compressed air usage and running suitable capacity compressor, replacing 'V' belts by flat belts, better insulation of chilled water lines and steam condensate lines, improving refrigeration condensor performance and house keeping activity, better illumination system, preheating of air from exhaust gas of hot air generator, and increasing the regeneration efficiency of milk pasteurisers. SRA

- 1932 Sri Hair Rao (K). Reduction of losses in dairy industry. *Indian Dairyman* 42(4); 1990; 190-197

Losses in dairy industry could be in terms of milk, energy, additives, packaging materials, industrial chemicals and dairy products which have financial implications. Effort to reduce the financial losses and extending the benefit of improved productivity are reviewed. Source of losses have been individually mentioned which covers spoilage, wastage of surplus material, spills and leaks, milk remaining in plant due to inadequate drainage of equipment, processing losses, packaging losses, losses due to analytical variations and tabulated for (i) standardised milk and surplus fat converted to ghee, (ii) toned milk and surplus fat converted to ghee, and (iii) conversion to SMP and ghee. SRA

- 1933 Sunita Srivastava and Sinha (RN). Importance of resuscitation of stressed indicator organisms in processed food. *Indian Dairyman* 42(2); 1990; 55-59

Foods during processing, storage and transportation are subjected to preservative treatments, but these are not lethal enough to kill all the microorganisms as some remain injured. The conventional selective media used for enumeration will not detect indicator or pathogenic bacteria, if the cells are stressed or injured by sublethal physical or chem. treatments and fail to indicate the quality of the product. In this general review the factors that influence injury to cells, nutritional requirement of the injured cells, resuscitation method for the recovery of injured cells, and the liquid and solid repair methods have been indicated and by incorporating a repair phase it is possible to use the recommended procedures more effectively for monitoring non-sterile products. 11 references. KAR

Milk

- 1934 Bora (K), Singh (J) and Goyal (GK). Changes in physico-chemical properties of goat milk due to boiling and simmering processes. *Indian Journal of Animal Science* 60(1); 1990; 112-114

The results indicate that the influence of simmering process was more on the physico-chemical properties of goat milk compared to the just boiling process. Significant increase (21.66%) in viscosity was noticed due to simmering process than boiling process (17.71%). The curd tension decreased during simmering (36.03%) than boiling (29.89%). Titratable acidity increased by 6.5% in simmering process, while it remain unchanged in samples heated upto just boiling. On heating, the pH of samples decreased slightly due to the two process. There was no effect on sp. gr. and fat content. An increase of total solids (0.13%) and total reducing capacity (10.32%) was noticed due to simmering process. Thiobarbitaric acid value (40.54%) increased due to boiling. The increase was more when the sample was simmered. BV

- 1935 Byrne (RDJr), Bishop (JR) and Boling (JW). Estimation of potential shelf-life of pasteurized fluid milk utilizing a selective preliminary incubation. *Journal of Food Protection* 52(11); 1989; 805-807

Selective preliminary incubation, followed by bacterial enumerations or detection techniques, was used to indicate potential shelf-life of pasteurized fluid milk. Commercial whole milk samples, stored at 7 C, were analyzed for bacterial and biochemical parameters and potential shelf-life using daily organoleptic evaluation. Prior to analysis, each samples was

subjected to the following preliminary incubations: milk alone, milk with benzalkonium chloride, milk and broth, milk and broth with benzalkonium chloride, and milk and a dairy gram-negative broth. The following bacterial enumerations were conducted: psychrotrophic bacteria count, modified psychrotrophic bacteria count (petrifilm and agar methods), and Moseley Keeping Quality test (petrifilm and agar methods). Catalase detection (headspace pressure and flotation time) and impedance detection times were also determined. Initial Standard Plate and Coliform counts (Petrifilm and agar methods) were conducted on each fresh samples but were not used for shelf-life prediction. Many of the preliminary incubations, in conjunction with enumeration or detection combinations, (especially modified Psychrotrophic Bacteria Count and impedance microbiology) gave good correlations to shelf-life (-0.89 and 0.91 resp). Thus, these methods could be used to indicate the potential shelf-life of pasteurized fluid milk. AS

- 1936 Hands (AH). Assay of inhibitory substance. *Journal of the Society of Dairy Technology* 42(4); 1989; 92-93

This short review describes, various assay methods available for detection of antibiotics in milk. Two types of tests are described, microbiological assay and rapid assays. JSS

- 1937 Hewedy (MM) and Smith (CJ). Detection of soy milk in pasteurized bovine milk. *Food Hydrocolloids* 3(5); 1989; 399-405

Urea alkaline polyacrylamide gel electrophoresis, SDS-PAGE, with and without dithiothreitol, and FPLC were used to detect quantitatively the presence of soy milk in pasteurized milk. The results obtained revealed that, whilst urea gel electrophoresis was not promising, SDS-PAGE detected 5% soy milk in bovine milk and FPLC proved to be more sensitive, clearly detecting 1% soy. AS

- 1938 Kankare (V) and Antila (V). Extraction of milk fat with supercritical carbon dioxide. *FAT Science Technology* 91(2); 1989; 485-488 (De).

The extraction of milk fat with supercritical carbon dioxide was carried out using a pilot plant extraction apparatus. The meeting properties of extracts are explained by the comp. of fatty acids and triacylglycerols. N

- 1939 Kneifel (W), Abert (T) and Luf (W). Influence of preheating skim milk on water-holding capacity of sodium salts of caseinates and coprecipitates. *Journal of Food Science* 55(3); 1990; 879-880

The effect of different preheat treatments of milk on the water-holding capacity of the corresponding sodium caseinates made under lab. conditions was investigated. Unheated skimmed milk, and milks heated under conditions ranging from 60 to 120 C for 1 min, resp., were used for the manufacture of the caseinates. Water-holding capacity was estimated using a method involving equilibration of the powder with excess water and measurement of the vol. of released water. Water holding progressively increased with heating, whereby with 120 C/1 min more than two-thirds of the dispersion vol. tested was retained. The whey protein content of the caseinates also varied according to temp. and water-holding capacity. AS

- 1940 Larsen (RF) and Anon (MC). Effect of water activity of milk upon growth and acid production by mixed cultures of *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. *Journal of Food Science* 55(3); 1990; 708-710, 800

Acid production and growth rates were determined in pure cultures of *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, and cocci/bacilli ratios in mixed cultures of both sp., using milk with modified water activity as culture medium. Maximal growth rates were always at water activity lower than 0.992 for all strains when water activity of milk was adjusted with glycerol, while maximal acid production rates were at water activity 0.992-0.983. Glucose had an inhibitory effect additional to that caused by lowering water activity. The cocci/bacilli ratio in mixed cultures increased as water activity decreased in most cases, because of the higher susceptibility of *L. bulgaricus* to water activity decrease. The behaviour of a mixed culture could not always be predicted from data of the component strains in a pure culture, showing some kind of symbiotic compatibility between sp. AS

- 1941 Mukunda Das (V). Future targets in milk and milk products marketing. Need for strategic directions. *Indian Dairyman* 42(4); 1990; 164-167

This paper highlights the strategic investigations (an essential component in marketing dairy enterprises viable) which marketing units and co-operative dairy sectors have to consider. Aspects covered include consumers segment size and its relation to purchasing power and the need for toning up of marketing organisations and changes in product mix. The strategic directions like market development, government intervention and tapping the rural market are the aspects to be considered. SRA

- 1942 Panfil-Kunciewicz (H), Kiswa (J) and Kunciewicz (A). Influence of lysozyme on the extent of the proteolytic phase of rennet coagulation of milk. *Acta Alimentaria Polonica* 14(2); 1988;

187-193

In the present studies, the influence of lysozyme on the extent of rennet proteolysis of milk, of alpha-casein solution and casein micelles, suspended in artificial serum of milk, was examined. The obtained results showed that lysozyme did not affect significantly the rennet hydrolysis of casein. At the highest level of lysozyme addition applied (2.0 mg/Cm^3), a certain lowering in the amount of glycopeptide released from casein by rennet, was observed; it makes it possible to suppose that lysozyme decreased the quantity of hydrolyzed casein indispensable for a coagulation of this protein. AS

- 1943 Singh (RS) and Harish Chander. Occurrence of *Listeria monocytogenes* in milk and milk products. *Indian Dairyman* 42(2); 1990; 61-66

An increase in the outbreaks of listeriosis in India due to contaminated milk and milk products and other foods has been observed and the work done in studying and controlling the organism in foods is negligible. This article describes the anatomy, physiology, ecology and virulence of the organisms. Extent of occurrence of *Listeria monocytogenes* in milk and cheese has also been indicated along with the epidemiology, thermal resistance and survival under storage conditions. KAR

Milk products

- 1944 Fergusson (PH). Developments in the evaporation and drying of dairy products. *Journal of the Society of Dairy Technology* 42(4); 1989; 94-101

Evaporation, membrane filtration, reverse osmosis, drying are defined. Energy efficiency of TVR, MVR, Fan MVR evaporators are described. The possibility of rebuilding existing TVR evaporates as MVR evaporators is also discussed. Development in drying are described. All the cases schematic diagrams are shown. JSS

- 1945 Kirtley (SA) and McGuire (J). On differences in surface constitution of dairy product contact materials. *Journal of Dairy Science* 72(7); 1989; 1748-1753

Dairy products were processed and packaged in contact with materials that exhibit markedly dissimilar surface properties. Pertinent surface properties of several dairy contact materials were quantified, and the relative tendency of each materials to absorb beta-lactoglobulin was observed. The presence of a min. in a plot of mass of beta-lactoglobulin adsorbed versus a property related to contact surface energy is discussed. Knowledge of the surface property corresponding to this mix.

may provide directions for the selection of contract materials best suited for particular processing or packaging applications and may provide direction for control of deleterious adhesive events common to dairy manufacturing. AS

Butter

- 1946 Farog (RS), Ali (MN) and Taha (SH). Use of some essential oils as natural preservatives for butter. *Journal of the American Oil Chemist's Society* 67(3); 1990; 188-191

Thyme and cumin essential oils were used in the present study in an attempt to prevent butter deterioration during storage at room temp. Butter oxidation and lipolysis were followed by measuring the acid, peroxide and TBA values. Lipolytic activity and total microbial and lipolytic bacterial counts were also measured. During butter storage, very little change in the peroxide and TBA values were found while a gradual increase in the acid value was noticed. The addition of cumin and thyme oils at 200 p.p.m. to butter caused very little increase in the acid value. The data for lipolytic bacterial counts were in general agreement with the acid values. Thyme and cumin essential oils showed a greater anti-hydrolytic effect and act as superior preservatives compared to BHT. AS

Cheese

- 1947 Aleandri (R), Schreider (JC) and Buttazeni (LG). Evaluation of milk for cheese production based on milk characteristics and formagraph measures. *Journal of Dairy Science* 72(7); 1989; 1967-1975

The characteristics of milk, including its clotting ability, were considered in an effort to develop an equation to predict yield of aged Parmesan cheese. The clotting properties of milk were measured using the Formagraph on 279 milk samples from the vats of 12 cheese plants over 12 months. A significant, nonlinear relationship was found between the Formagraph measure of curd firmness and cheese yield. The relationship between predicted cheese yield and curd firmness depended on fat level. Increasing curd firmness increased cheese yield only at the low fat level. Intermediate values of curd firmness predicted highest cheese yield for the intermediate fat level. At the high fat level, increasing curd firmness resulted in decreasing predicted cheese yields. Cheese yields increased with fat and protein level. It appears that the Formagraph measure of curd firmness is related to cheese yield as an indicator of casein aggregation properties of the milk. No other Formagraph measures were significantly associated with actual aged cheese yield. AS

- 1948 Camacho (L) and Sierra (C). Sanitary and technological diagnosis of the goat cheese rural process. *Archivos Latinoamericanos de Nutricion* 38(4); 1988; 935-945 (Es).

A sanitary and technological diagnosis of the goat cheese rural process was carried out. The purpose was to obtain more information for the planning of a program aimed to the improvement of this small agroindustry. Samples of milk, curdle, dry abomasum, rennet, water and cheese of 10% of the small industries of two rural villages in two agricultural seasons, were taken. Moreover, dilutions of the utensils and goat udders were prepared. The samples were subjected to microbiological analysis of mesophilic aerobic bacteria count, most probable number of total and fecal coliforms, and detection of *Staphylococcus aureus* coagulase (+), *Salmonella typhi* and *Brucella melitensis*. Proximate chem. analysis and detn. of NaCl and titratable acidity in milk, cheese, dry abomasum and rennet, were carried out. Goat milk was also subjected to analysis of density. It was found that significant sanitary failures are present during the whole goat cheese process, although the highest bacterial contamination occurred at the milking, curdling and filling stages. These are characterized by excessive handling and absolute lack of hygiene. The pathogen *B. melitensis* was absent; therefore, the causes of poisoning were attributed to the toxin produced by *S. aureus* and to the significant count of fecal coliforms found in the goat cheese. Even though the goats are fed under a poor feeding system, the milk presented a normal physical and chem. comp. Nevertheless, protein and fat matter losses occur during cheese preparation, as a result of handling practices and lack of process control. AS

- 1949 Esteban (MA) and Marcos (A). Equations for calculation of water activity in cheese from its chemical composition. A review. *Food Chemistry* 35(3); 1990; 179-186

This paper reviews the relations between the chem. comp. of cheese and its water activity found by linear regression analysis, including twelve regression equations proposed for the chem. prediction of such activity in different types of cheese. Equations, both applicable to all types of cheese with water activity > 0.90 and others valid only for fresh, bacterial-and mould ripened or processed cheeses, are reviewed. AS

- 1950 Iverson (JL) and Sheppard (AJ). Detection of adulteration in cow, goat, and sheep cheese utilizing gas liquid chromatographic fatty acid data. *Journal of Dairy Science* 72(7); 1989; 1707-1712

Programmed temp. GLC of fatty acid butyl esters was done on the extracts from cow, sheep and goat cheese. Lauric: capric fatty acids ratio was found to be characteristic in each case. It was possible to determine adulteration of cow cheese with sheep or goat cheese and vice-versa. Whereas it was not possible to determine extent of adulteration between sheep and goat cheese. JSS

- 1951 Kamaly (KM) and Marth (EH). Enzyme activities of lactic streptococci and their role in maturation of cheese. A review. *Journal of Dairy Science* 72(7); 1989; 1945-1966

Research related to distribution of proteinases and peptidases among cellular structures of lactic streptococci, their characterization and their role in cheese maturation have been reviewed. In addition effect on fats and enzymology of cheese ripening have also been considered. JSS

- 1952 Ramaswamy (K) and Sivarami Reddy (K). Microbiological standards for processed cheese. *Indian Dairyman* 42(4); 1990; 205-208

Working standards which are not presently available for processed cheese are suggested based on the microbiological studies carried out at the Milk Products Factory, Chittoor. The source of microorganisms in processed cheese have been indicated and the analytical methods for coliform bacteria, yeast, moulds, aerobic and anaerobic spore-formers have been explained. Bloat test for cans, microbial test for packaging material and keeping quality of the cheese have been mentioned. The recommended standards are max. of 60 yeast moulds, 200 aerobic spores, 100 anaerobic spores per g. and absence of coliforms in 0.1 g of processed cheese. SRA

- 1953 Tatsumi (K), Nishiya (T), Ido (K), Hanawa (N) and Tamaki (K). Effects of emulsifying salts and heating conditions on functional properties and texture-profile of processed cheese. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 986-992 (Ja).

Effects of emulsifying salts and holding conditions after cooking on the functional properties of processed cheese were investigated. Emulsifying salt such as sodium citrate, disodium phosphate, sodium pyrophosphate and sodium polyphosphate were added to the three types of natural cheeses; Emmental, Gouda and Cheddar. The functional properties of the resulting products such as meltability and stringiness were determined and compared with those of the cheeses cooked without these emulsifying salts. The functional properties of each cheese changed with holding temp. and time after cooking. It was indicated that in the absence of the emulsifying salt, these functional changes were associated with the amount of

non-ionic Ca in cheese rather than cheese age, while they were strongly related to the type of emulsifying salt when the emulsifying salt was added approx. 2% to cheese. AS

- 1954 Tatsumi (K), Nishiya (T), Ido (K), Hanawa (N) and Tamaki (K). Effect of cooking temperature and pH on emulsification of cheese in the absence of emulsifying salt. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 1000-1002 (Ja).

Effects of cooking temp. and pH on emulsion stability of melted cheese in the absence of emulsifying salt were investigated. Five types of cheese whose pH ranged from 5.1 to 5.7 were cooked at 60, 65, and 70 C, resp. Max. water content levels of these cooked cheeses were then determined. It was found that the max. level of each cheese decreased with increasing cooking temp., and was also dependent on initial pH of each cheese rather than on finally adjusted pH of it. The cheese whose initial pH was nearly 5.5 showed the highest water content level among the five. AS

- 1955 Tatsumi (K), Nishiya (T), Yamamoto (H), Ido (K), Hanawa (N), Kensuke I and Tamaki (K). Emulsification of cheese in the absence of emulsifying salt. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 981-985 (Ja).

A method for processing cheese in the absence of emulsifying salt was investigated. Several hard type natural cheeses such as Gouda and Cheddar were used for this exp. When the above cheeses were cooked and melt at 80 C in the absence of emulsifying salt, their water contents and pHs were found to be strongly responsible for emulsion stability of the melt. Within the critical range of the water content and pH in each cheese types, stable cheese emulsion was obtained, and the resulting product after cooked at 5 C possessed homogeneous texture. Excessive addition of water to cheese and increasing pH up to more than 6.2 caused water and oil separation. Since the use of either high shear-force during cooking or well-ripened cheese was not a critical factor to obtain stable emulsion, the water and oil absorption capacities of Ca paracaseinate in cheese at various pHs were considered to be important factors in formulation of the stable emulsion without emulsifying salt. In the absence of emulsifying salt, cheese cooking was attained at 80 C in the same manner as the standard processed cheese-making within the limited ranges of water content and pH of cheese. AS

- 1956 Valdes-Martinez (SE), Quezada-Garcia (J), Rios-Pazaran (F) and Valle-Vega (P). Changes during cheese curing. *Journal of Food Biochemistry* 14(2); 1990; 127-135

Port-Salut, Gouda and Edam cheese were analyzed for fat, protein, moisture and ammonia evolution during commercial curing (50 days for the first two cheese and 57 days for the last one). Fat (approx. 33%), protein (approx. 31%) on a wet basis and moisture (between 25 and 37%) content of the cheeses remained practically constant throughout the exp., while considerable changes were observed for ammonia evolution when analyzed by direct microdistillation and by ammonia sensitive electrode, as well as between whole and defatted samples. Ammonia recovery for the microdistillation method was below the expected value for the 3 cheeses analyzed; the contrary happened with the ammonia sensitive electrode, where higher ammonia values were detected in the whole cheese samples; Gouda, 2089 mg/kg; Edam, 756 mg/kg and Port-Salut, 2857 mg/kg. These data suggest that the use of the electrode can be a useful tool in ammonia detn., avoiding losses during sample preparation, as normally happens during microdistillation that requires defatting. AS

Cheddar cheese

- 1957 McEwan (JA), Moore (JD) and Collwill (JS). The sensory characteristics of Cheddar cheese and their relationship with acceptability. *Journal of the Society of Dairy Technology* 42(4); 1989; 112-117

Seven var. of Cheddar cheese were evaluated using free-choice and conventional (quantitative descriptive analysis) profiling. This study looks at the odour and flavour attributes of the cheeses, as well as the more widely reported texture characteristics. Generalized Procrustes analysis was used to analyse data from both profile methods, as well as being applied to compare the perceptual spaces obtained from the two methods. The results obtained from both profiling procedures were similar and easily interpretable, suggesting that the less time consuming free choice methods is an appropriate technique when used with trained assessors. Strength of odour and flavour, and rubbery and grainy texture were some of the important attributes separating the cheeses in a two dimensional perceptual space. Preference judgements were obtained from 50 consumers using a nine point hedonic scale. These data were related to the profile space using Preference Mapping and the best model evaluated. AS

Cheese-whey

- 1958 del Pilar Buera (M), Chirife (J) and Resnik (SL). Nonenzymatic nonoxidative browning in hydrolyzed shelf-stable concentrated cheese whey. *Journal of Food Science* 55(3); 1990; 697-700

The rate of brown colour development in hydrolyzed concentrated cheese whey (HCCW), and in model systems of related comp., was studied. Degree of lactose hydrolysis was a relevant parameter controlling rate of colour changes, both in modified whey or in related model systems. Added CaCl had a strong inhibitory effect on caramelization browning in model systems in which no amino compounds were added. This inhibitory effect was less important in model systems containing whey proteins and in HCCW in which Maillard's browning is the main mechanism of darkening. Effects of pH and temp. were similar to that previously reported for nonhydrolyzed conc. cheese whey, as well as for many model systems containing sugars and amino acids. AS

Mozarella cheese

- 1959 Tunick (MH), Basch (JJ), Maleeff (BE), Flanagan (JF) and Holsinger (VH). Characterization of natural and imitation Mazarella cheese by differential scanning calorimetry. *Journal of Dairy Science* 72(7); 1989; 1976-1980

Differential scanning calorimetry was used to distinguish natural Mozzarella cheese from imitation Mozzarella made with calcium caseinate. The enthalpy of the milk fat melting transition at 18 C decreased with increasing caseinate concn. Scanning electron microscopy studies revealed on agglomeration of lipids in the imitation samples, whereas the natural cheese had a uniform dispersion of fat globules. The addition of the caseinate apparently affected the crystallization of the fat, leading to the enthalpy reduction. Electrophoresis and atomic absorption procedures did not differentiate between natural and imitation samples. AS

Teleme cheese

- 1960 Zerfiridis (GK), Alichanidis (E) and Tzanetakis (NM). Effects of processing parameters on the ripening of Teleme cheese. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 169-174

Acid development by using various lactic acid cultures in Teleme cheese, time of curd drainage in the hoop and salt uptake by the curd and cheese were studied in order to improve cheese quality. Chemical and microbiological changes of cheese were studied over one yr of ripening and storage. Teleme cheese has been manufactured successfully using *S. lactis* and *L. bulgaricus* in a 1:3 ratio resp., at a concn. of 0.5% and ripened for 20 min. Twenty four h after manufacture the pH was 4.8 and salt concn. in the cheese was 2.5%. After 15 days of storage at 16 C the pH, salt and moisture were 4.6 greater than or equal to 5% and less than or equal to 55% resp., which

remained constant over one yr of storage at 4-5 C. The water soluble nitrogen ranged from 11.50 to 13.17% of the total nitrogen at 1-3 months of storage and attained 30.55% after one yr of storage. Cheese microflora increased rapidly during 15 days storage period at 16 C and decreased from 10^9 to 10^6 cfu/g during the one yr storage period. Proteolytic bacteria decreased more rapidly than lactobacilli and psychrotrophs while staphylococci, coliforms and yeasts were almost absent in the 3-month-old cheese. Microflora changes were related to chem. changes in the cheese. AS

Ice cream

- 1961 Goff (HD), Mc Curdy (RD) and Gullett (EA). Replacement of carbon-refined corn syrups with ion exchanged corn syrups in ice cream formulations. *Journal of Food Science* 55(3); 1990; 827-829, 840

Ice cream was manufactured utilizing 10 corn syrups at 5% (dry basis) in the mix, 30 DE, 42 DE, 42 DE high maltose (HM), 55 DE HM and 64 DE, each of which was processed through the carbon-refined and ion-exchanged processes. An increase in DE of the syrup led to a decrease in mix viscosity, a decrease in the freezing point of the mix, a decrease in fat destabilization and a decrease in firmness of the ice cream. The ion-exchanged syrups decreased the mix viscosity and produced a drier ice cream with greater fat destabilization but had no influence on mix freezing point depression, overrun, firmness or meltdown. Sensory results from the 42 DE HM and 55 DE HM carbon-refined and ion-exchanged products evaluated in this study showed no differences in sweetness or texture. The flavour and acceptability of 42DE HM carbon-refined syrup in ice cream was preferred less than the 42DE HM or 55DE HM ion-exchanged syrups. AS

- 1962 Lindamood (JB), Grooms (DJ) and Hansen (PMT). Effect of hydrolysis of lactose and sucrose on firmness of ice cream. *Food Hydrocolloids* 3(5); 1989; 379-388

Ice cream mixes were treated enzymatically with combinations of lactose (EC 3.1.1.12) and invertase (EC 3.2.1.26) to cause 0-78% hydrolysis of lactose and 0-50% hydrolysis of sucrose. While the action of the invertase was limited principally to sucrose, the lactase enzyme caused hydrolysis of both lactose and sucrose. Relative firmness (hardness) of the ice cream was measured in the temp. range of -15 to -18 C and was assessed by the work expended by penetrating the frozen ice cream to a depth of 10 mm with a cylindrical probe of diameter 7 mm, travelling at 20 mm/min. Hydrolysis of lactose and sucrose increased the sweetness but decreased the freezing point of the mix and firmness of the

finished product. Within the hydrolysis range achieved (0-59.3% of the total saccharides), organoleptic properties and melt-down characteristics were not significantly impaired. AS

Milk powder

- 1963 Parris (N), White (AE) and Farrell (HMJr). Identification of altered proteins in non-fat dry milk powder prepared from heat-treated skim milk. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 824-829

Reversed-phase high-performance liquid chromatography (RP-HPLC) and gel electrophoresis (SDS-PAGE) were used to monitor changes in the protein profiles of pooled herd (Holstein, Ayrshire, and Brown Swiss) non-fat milk (NFM) preheated to 63, 74, and 85 C before spray-drying and storage for 8 months. Elution profiles of rehydrated non-fat dry milk (NFDM) changed with preheat temp. and storage time. A whey-casein complex comprised of BSA, beta-lactoglobulin, alpha-lactalbumin, and kappa- and α_{s2} caseins formed in NFDM samples preheated to 74 and 85 C. Some renaturation of whey proteins occurred as a result of storage time. The whey-casein complex is stabilized through disulphide linkage. Examination of isolated insoluble material (2-6% of total protein) indicated that it is composed almost entirely of caseins that appear to be aggregated with lactose. AS

- 1964 Woodhall (M). The application of hazard analysis and critical control point system of milk powder manufacture. *Journal of the Society of Dairy Technology* 42(4); 1989; 102-105

All food manufacturers have a responsibility to have a full knowledge of the risks involved in their process, extending from raw materials through to consumption. The Hazard Analysis and Critical Point (HACCP) system is described as a management tool to develop preventive procedures for powder manufacture. Traditional HACCP focuses on microbiological pathogens as the hazard to the consumer. Within Dairy Crest Ltd a hazard is defined in the wider context of failure to meet product and process specifications. This paper describes the origin and development of HACCP, and gives a checklist for its successful implementation. Particular problems in implementation are discussed with reference to the author's experience. HACCP is only as effective as the management team driving it, and they must be clear as to the documentation they are setting out to produce. AS

Wheys

- 1965 Christopherson (AT) and Zottola (EA). Whey permeate as a medium for mesophilic lactic acid streptococci. *Journal of Dairy*

Science 72(7); 1989; 1701-1706

Growth of three lactic streptococci was studied in whey permeate, reconstituted skim milk permeate, double concentrated UF whey reconstituted skim milk and reconstituted whey. All the media supported growth of cultures. The results of this study indicate that whey permeate may be suitable as growth medium for mesophilic lactic acid streptococci. JSS

- 1966 Kanno (C). Characterization of multiple forms of lactophorin isolated from bovine milk whey. *Journal of Dairy Science* 72(7); 1989; 1732-1739

A glycoprotein, lactophorin, was isolated from the proteose-peptone of whey. Lactophorin was separated into 7 components using SDS-PAGE electrophoresis. The 7 components were further characterized by amino acid analysis and hexose hexosamine analysis. JSS

- 1967 Lindmann-Schneider (V) and Fennema (O). Stability of lysine, methionine, and tryptophan in dried whey concentrate during storage. *Journal of Dairy Science* 72(7); 1989; 1740-1747

Samples of dried whey protein conc. at water activities .15, .24, .31, and .41 were stored for up to 6 months at -40, 5, 20, and 40 C. After storage the protein was hydrolyzed and the concn. of methionine, available lysine, and tryptophan were determined by HPLC. Methionine and tryptophan contents did not change significantly during storage at any of the conditions tested. The available lysine content decreased most at the highest water activity(.41) and the highest temp. (40 C), the loss being 23% after 3 months. Losses of lysine were influenced more by temp. than by water activity within the range of conditions tested. At temp. of 20 C or lower, losses of lysine after 6 months of storage were less than 8% at all water activities tested. AS

Whey proteins

- 1968 Noh (B) and Richardson (T). Incorporation of radiolabeled whey proteins into casein micelles by heat processing. *Journal of Dairy Science* 72(7); 1989; 1724-1731

Skim milk was heated at 70, 95 and 140 C to simulate the processes of pasteurization, forewarming, and UHT sterilization, and the specific interactions between alpha-lactalbumin or beta-lactoglobulin and the caseins studied using tracer amounts of added ^{14}C labeled whey protein. Radioactivities of the whey and of the washed casein pellets from renneted skim milk were measured and the extent of the interaction estimated. Upon heating skim milk at 70 C for 45

seconds, less than 2% beta-lactoglobulin and less than 3% alpha-lactalbumin were incorporated into the curd. Heating at 95 C for 5. to 20 min resulted in 58 to 85% of the beta-lactoglobulin becoming associated with the curd. Heating at 140 C for 2 and 4 seconds caused 43 and 54% of the beta-lactoglobulin and 9 and 12% of the alpha-lactalbumin, resp., to be bound to the curd fraction. The radiolabeling technique is very sensitive and useful for tracing low levels of interaction between whey proteins and casein in heated milk systems. AS

Yoghurts

- 1969 Jordano (R), Jodral (M), Martinez (P), Salmeron (J) and Pozo (R). Aflatoxin-producing strains of *Aspergillus flavus* in yoghurt. *Journal of Food Protection* 52(11); 1989; 823-824

Fungal contamination was investigated in two batches of commercial yoghurt obtained from two different Spanish manufacturers, with special reference to the detection of aflatoxin producing strains of *Aspergillus*. The samples were classified into four grades of standard, according to the level of mold present: target, acceptable, doubtful, and reject. The frequency of appearance of different genera of molds in yoghurt was also determined. Sp. of *Aspergillus*, potential producers of mycotoxins, were frequently identified in the samples analyzed. In seven out of 20 samples (35%), aflatoxin-producing strains of *Aspergillus flavus* were detected. AS

- 1970 Martinou-voulasiki (IS) and Zerfiridis (GK). Effect of some stabilizers on textural and sensory characteristics of yoghurt ice cream from sheep's milk. *Journal of Food Science* 55(3); 1990; 703-707

Yoghurt ice cream made of 6.5% sheep's milk fat and 11.5% of non-fat milk solids (MSNF) derived by 83% from sheeps milk contained decreased lactose and increased protein by approx. 20% and 25%, resp., compared to the conventional product from cow's milk. Acidity of the final product was from pH 4.4 to 4.9. Stabilizers that were tried were xanthan gum, guar gum and a commercial stabilizer of concn. 0.0, 0.1, 0.2, 0.3, 0.4 and 0.5%. Based on detn. of physical qualities as well as on the sensory evaluation of the yoghurt ice cream, xanthan gum gave optimum results at 0.2% concn., guar gum at 0.3% while the commercial stabilizer was partially satisfactory up to 0.5% concn. AS

Milk proteins

- 1971 Olson (RL). Effects of polysaccharides on rennet coagulation of skim milk proteins. *Journal of Dairy Science* 72(7); 1989; 1695-1700

The effects of commercially available polysaccharides on rennet coagulation of milk were investigated. Polysaccharide material from a slimy strain of *Lactococcus lactis* was examined. Clotting time was measured using a rolling bottle method and a Formagraph. The Formagraph also indicated the rate of curd firming and final curd firmness. Clotting time was reduced, curd formation rate increased, and curd firmness reached a max. with addition of low methoxyl pectin. Xanthan reduced curd formation rate and decreased gel firmness. The polysaccharide from *L. lactis* produced results similar to low methoxyl pectin. AS

Caseins

- 1972 Dalglish (DG). Caseins, casein micelles and caseinates. *Journal of the Society of Dairy Technology* 42(4); 1989; 91-92

This short review highlights some of the properties of caseins and casein micelles. JSS

- 1973 Le Meste (M), Viguiere (L), Lorient (D) and Simatos (D). Rational diffusivity of solutes in concentrated caseinates. Influence of glycosylation. *Journal of Food Science* 55(3); 1990; 724-727

Numerous factors control the diffusion of small molecules in concentrated polymeric systems. The aim of the present work was to study the influence of an internal plasticization treatment (glycosylation) of a protein (caseinate) on the rotational diffusivity of nitroxide radicals as a function of hydration. Rotational diffusivity was measured using electron spin resonance. High levels of glycosylation improved the protein flexibility, and above a given level of mobility, this higher flexibility was accompanied by an increased rotational diffusivity of the small solutes. Water acts as a plasticizer by increasing the free vol. of the system and as a solvent by dispersing the molecules. AS

MEAT AND POULTRY

- 1974 O'Neill (E), Morrissey (PA) and Mulvihill (DM). The surface-active properties of muscle proteins. *Food Chemistry* 35(1); 1990; 1-12

The surface-active properties of myosin, actomyosin, F- and G-actin at the air-solvent₄ interface, at initial bulk phase concn. in the range of 10^{-4} % to 10^{-2} % w/v were determined by the drop vol. method. Overall myosin was the most effective surface tension depressor, followed by actomyosin, F-actin and

G-actin. The surface pressures attained after 40 min at an initial bulk phase concn. of 10^{-2} w/v were 21.02, 19.27, 17.25 and 14.91 mNm⁻¹ resp. Furthermore, myosin effected the most rapid change in surface pressure during the initial 5-min period. AS

Meat

- 1975 Beliard (E), Abrall (B) and Bourgeois (CM). Selection of lactic acid bacteria for their inhibitory activity against *Pseudomonas putida*. Application to fresh ground meat preservation. *Sciences Des Aliments* 9(4); 1989; 665-684 (De).

Several hundred strains of lactic acid bacteria were selected in meat or meat products as antagonists against a strain of *Pseudomonas putida*. The different methods were used to characterize the inhibitory substances; lactic acid, hydrogen peroxide and bacteriocins or antibiotics. In spite of the diversity of the products screened as strains sources, no antibiotic nor bacteriocin-producing strain were isolated. However results confirm that hydrogen peroxide production by lactic acid bacteria can inhibit (*Pseudomonas* although catalase-positive. The exp. in fresh ground meat showed that the strains inoculated at a level of 10^6 CFU/g grow only slightly at 4 C. However the growth of undesirable microorganisms such as *Brochothrix thermosphacta* and *Pseudomonas* were delayed by about 48 h with the more efficient strain. AS

- 1976 Campanini (M), Barbuti (S) and Camorali (G). Quick evaluation of microbial contamination of fresh meat by an impedimetric procedure. *Industria Conserve* 64(2); 1989; 121-125 (It).
- 1977 Dolata (W). Effect of knife cutting edge shape on electric energy consumption during meat comminution in mechanical cutter. *Acta Alimentaria Polonica* 14(2); 1988; 139-143

The effect of different shapes of cutting edges of knives on electric energy consumption during model comminution of sausage meat mixtures in a mechanical cutter was determined. AS

- 1978 Ladikos (D) and Lougovois (V). Lipid oxidation in muscle foods. A review. *Food Chemistry* 35(4); 1990; 295-314

Lipid oxidation is a major cause of deterioration of the quality of stored meat and meat products. This review deals with the mechanism and the methods used to follow lipid oxidation, as well as the interaction of lipids/lipid oxidation products with food components and their possible biological effects. Emphasis is given to the presentation of the anti-

and pro-oxidant properties of various compounds and conditions and their relative importance in oxidative rancidity is discussed. AS

- 1979 Lamikanra (VT) and Dupuy (HP). Analysis of volatiles related to warmed over flavour of cooked chevon. *Journal of Food Science* 55(3); 1990; 861-862

The development of warmed-over flavour (WOF) in cooked chevon was monitored from its Tenax trapped volatiles by direct gas chromatography (GC). WOF markers, pentanal, hexanal, heptanal, 2,3-octanedione and nonanal were identified from volatile profiles obtained with packed poly MPE coated Tenax-GC column. These volatile markers as well as the total volatiles increased over 6 days storage of cooked chevon at 4 C. Increase in hexanal was more rapid than the other WOF markers. Results suggest WOF development in cooked chevon is more rapid than reported rates for other cooked meats. AS

- 1980 McMullen (L) and Stiles (ME). Storage life of selected meat sandwiches at 4 C in modified gas atmospheres. *Journal of Food Protection* 52(11); 1989; 792-798

The refrigerated storage life of selected meat sandwiches packed in elevated carbon dioxide atm. with air or nitrogen was studied by acceptability scores of untrained panelists and by microbiological analysis. Commercially produced sandwiches, including processed meats, roast beef and hamburgers, were packed in gas impermeable film with 50% carbon dioxide and 50% air, stored at 4 C, and compared with a frozen reference sample. Processed meat products were still acceptable up to 35 days storage, roast beef for 28 to 35 days storage, and hamburger for only 14 days. The effect of gas atm. with 30, 50, or 70% carbon dioxide and either air or nitrogen, on acceptability of lab. pack aged bologna, ham, roast beef, and hamburger, was also studied. The most significant effect was observed with hamburger samples, in which exclusion of oxygen extended storage life from 14 to 35 days. Initial product quality was a more important factor determining the length of storage life than the range of gas atm. between 30 and 70% carbon dioxide except for hamburger packaged in atm. containing air. A universal storage life for these products cannot be recommended. However acceptance of the products by an untrained taste panel generally extends beyond achievement of max. microbial load. AS

- 1981 Nuckles (RO), Smith (DM) and Merkel (RA). Meat by-product protein composition and functional properties in model systems. *Journal of Food Science* 55(3); 1990; 640-643, 682

Comp. and functional properties of selected meat by-

products were studied. Mechanically deboned chicken meat (MDCM) and meat by-products, (pork lung lobes, pork liver, beef lung lobes, beef spleen, beef heart) varied in their proximate comp., amount of the three major protein fractions (low ionic strength soluble (LIS), high ionic strength soluble (HIS), insoluble) and collagen content. Cooked batter model system reheat yield was positively correlated with the quantity of HIS proteins and the percentage myosin and actin in the HIS protein fraction. Stress and strain at failure of the cooked batters were inversely correlated to the amount of LIS proteins and positively correlated with the percentage of myosin and actin in the by-products. AS

1982 Palombo (R) and Wijinagaards (G). Predictive model for the lightness of comminuted porcine lean meat during heating. *Journal of Food Science* 55(3); 1990; 601-603, 612

1983 Palombo (R) and Wijingaards (G). Kinetic analysis of the effect of some processing factors on changes in colour of comminuted meats during processing. *Journal of Food Science* 55(3); 1990; 604-612

Changes in the psychometric colour attributes lightness (L^*), hue angle (H^*) and chroma (C^*) of porcine lean meat batters during processing were kinetically analyzed using the empirical approach of mathematical modeling. The changes during 24 h storage at 15 °C and during heating at 40, 50, and 60 °C were fitted into a model and analyzed for the effects of air pressure during chopping, cutter type and enzyme inhibitors. For changes in L^* and C^* at 40, 50 and 60 °C such kinetic analysis was not possible. Among the factors studied, "air pressure" had the greatest overall effect on colour. The effect of "cutter type" was intermediate and that of enzyme inhibitors least. The effects found could be ascribed to changes in absorption and scatter properties of the meat batters. AS

1984 Taylor (AA), Down (NF) and Shaw (BG). A comparison of modified atmosphere and vacuum skin packing for the storage of red meats. *International Journal of Food Science and Technology* 25(1); 1990; 98-100

Beef

1985 Abbar (FM) and Mohammad Tahir (M). Beef casings and finished beef sausages as a source of *Salmonella* in Iraq. *Journal of Food Protection* 52(4); 1989; 254-255, 258

1986 Cooksey (K), Klein (BP) and McKeith (FK). Thiamin retention and other characteristic of cooked beef loin roasts. *Journal of Food Science* 55(3); 1990; 863-864

1987 Crouse (JD) and Koohmaraie (M). Effect of post-cooking storage conditions on shear-force values of beef steaks. *Journal of Food Science* 55(3); 1990; 858, 860

1988 Davey (KR). A model for the hot water decontamination of sides of beef in a novel cabinet based on laboratory data. *International Journal of Food Science and Technology* 25(1); 1990; 88-97

A predictive model for the hot water decontamination of sides of beef in a novel design of cabinet is presented and its usefulness illustrated. The model is based on lab. data and permits assessment of bacterial reductions, production rates, unit energy costs and changes to cabinet dimensions and ambient temp. The advantages of a standard cabinet recommended for a wide range of abattoir production rates are outlined. For a production rate of 135 sides h^{-1} , 90% and 99% reductions in bacteria at the site min treatment (the neck) could be achieved at costs of less than 0.016% and 0.03% resp. of the value of the meat. The model assumes limited exposure of the sides to the hot water to prevent a permanent impairment of meat bloom. A graphical summary is presented and limitations of the model are discussed. AS

1989 Dickson (JS). Comparison of homogenization by blending or stomaching on the recovery of *Listeria monocytogenes* from beef tissues. *Journal of Food Science* 55(3); 1990; 655-657

1990 Medina (MB). Selective inhibition of lectin induced rabbit erythrocyte agglutination by hydrolysates of skeletal beef protein. *Journal of Food Science* 55(3); 1990; 867-868, 884

Soybean lectin (SBL) induced agglutination of rabbit red blood cells (RRBC) was selectively inhibited by partial tryptic hydrolysates of beef protein isolate and all-beef frankfurter. These interactions have been utilized to design a noninstrumental agglutination method to detect non-beef muscle protein in meat products. The presence of non-beef muscle proteins in cooked sausages is reflected by a reduced level of inhibition established for the all-beef skeletal muscle hydrolysate. The method effectively detected the presence of 10-50% non-beef proteins (soy, pork, pork rind, chicken, turkey and surimi) substituted in all-beef frankfurter. AS

1991 Noble (JM), McMahon (PS), Seman (DL), Moody (WG) and Doughlass (LW). Effect of institutional heating methods of cold and hot boned restructured beef roasts. *Journal of Food Science* 55(3); 1990; 658-660, 773

1992 Raharjo (S), Sofos (JN), Maga (JA) and Schmidt (GR). Influence

of meat restructuring systems of lipid oxidation in beef. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 199-203

- 1993 Trout (GR) and Sucas Dale. Prevention of warmed-over flavour in cooked beef. Effect of phosphate type, phosphate concentration, a lemon juice/phosphate blend, and beef extract. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 665-669
- 1994 Vazquez-Moreno (L), Bermudez (MCA), Langure (A), Higuera-Ciapara (I), Diaz De Aguayo (M) and Flores (E). Antibiotic residues and drug resistant bacteria in beef and chicken tissues. *Journal of Food Science* 55(3); 1990; 632-634, 657

Mutton

Sheep

Lamb

- 1995 Paul (P), Venugopal (V) and Nair (PM). Shelf-life enhancement of lamb meat under refrigeration by gamma-irradiation. *Journal of Food Science* 55(3); 1990; 865-866

Influence of low dose gamma-irradiation on the storage stability of fresh lamb meat (prepacked chunks and mince) at 0-3 C was examined by sensory, microbiological and chemical criteria. The meat chunks irradiated at 1.0 kGy and 2.5 kGy remained in acceptable condition for 3 and 5 wks resp., whereas the corresponding shelf-life for irradiated (1.0 KGY and 2.5 kGY) mince were 2 and 4 wks resp. In contrast, unirradiated meat chunks and mince spoiled within 1 wk of storage at 0-3 C. AS

Pork

- 1996 Ahmed (PO), Miller (MF), Lyon (CE), Vaughters (HM) and Reagan (JO). Physical sensory characteristics of two-fat fresh pork sausage processed with various levels of added water. *Journal of Food Science* 55(3); 1990; 625-628
- 1997 Boles (JA) and Parrish (FCJr). Sensory and chemical characteristics of precooked microwave-reheatable pork roasts. *Journal of Food Science* 55(3); 1990; 618-620
- 1998 Heymann (H), Hedrick (HB), Karrasch (MA), Eggeman (MK) and Ellersieck (MR). Sensory and chemical characteristics of fresh pork roasts cooked to different endpoint temperatures. *Journal of Food Science* 55(3); 1990; 613-617
- 1999 Melgar (MJ), Sanchez-Monje (JM) and Bellow (J). Influence of

the technological process involved in the curing of sausages and salt-meat over the fat characteristics of pork back lard. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 199-208 (Es).

- 2000 Szmanko (T), Duda (Z), Kajdan (L) and Kubis (B). Storage of selected sort of processed meat product at cryoscopic temperature: An attempt at energy conservation. Changes in proteins, amino acids balance and *in vitro* digestibility of cured smoked raw pork-loin. *Acta Alimentaria Polonica* 14(2); 1988; 145-156

Products

- 2001 Abrall (B) and Bourgeois (CM). Counting of total microflora of food products by direct epifluorescent filter technique (DEFT). *Sciences Des Aliments* 9(4); 1989; 713-724 (Fr).

The direct epifluorescent filter technique and the standard method have been compared to count the total flora of 21 samples of raw ham, 92 samples of minced beef, 57 samples of raw fish fillets. The correlation coeff. for these three kinds of products, 0.88, 0.84, 0.95 resp., are satisfactory. The prefiltration treatment applied to the samples does not reduce the total counts. The visual count limits the number of analyses to 20-30 daily, but the use of an image analyser increase considerably the possibilities. The correlation between visual counts and automatic counts was $r = 0.98$ for 92 samples of minced beef. AS

- 2002 Cantoni (C), Valenti (M) and Comi (G). *Listeria monocytogenes* and others *Listeria* spp in meat products and in meat factories. *Industrie Alimentari* 28(272); 1989; 605-607, 610 (It).
- 2003 Pensabene (JW) and Fiddler (W). Determination of ten N-nitroso amino acids in cured meat products. *Journal of the Association of Official Analytical Chemists* 73(2); 1990; 226-230

A rapid, sensitive, and accurate solid-phase extraction method was developed for the measurement of 10 N-nitrosoamino acids (NAAs) in cured meat products. In the procedure, the comminuted meat was mixed with sulfamic acid and Cellite, and then added to a glass column containing anhydrous sodium sulphate. The column was washed with pentane, and the NAAs were eluted with ethyl acetate. The eluate was concentrated, then derivatized with diazomethane followed by acetic anhydride-pyridine reagent. The NAA methyl esters and their acylated hydroxy derivatives were separated by gas chromatography on a DB-5 fused silica capillary column and quantitated with a thermal energy analyzer, a chemiluminescence detector specific for nitric oxide derived from the thermal

denitrosation of nitrosamines. Recovery of 10 of the NAAs exceeded 75% at the 10 p.p.b. level. The method is applicable to a wide range of cured meat products. AS

- 2004 Vojdani (F) and Antonio Torres (J). Potassium sorbate permeability of methylcellulose and hydroxypropyl methylcellulose coatings. Effect of fatty acids. *Journal of Food Science* 55(3); 1990; 841-846

Surface microbial stability is a major determinant of the shelf-life of refrigerated meat products. Surface microbial growth has also been noticed in intermediate moisture foods exposed to temp. fluctuations. One solution to this problem is to apply edible coatings to the food surface which control diffusion of antimicrobial agents into the food. Films with such properties were identified using a permeability cell. Methyl- and hydroxypropyl methylcellulose mixed with lauric, palmitic, stearic, and arachidic acid significantly lowered the potassium sorbate permeation rate relative to cellulose ether films containing no fatty acids. Permeability detn. at 5, 24, 32 and 40 C showed excellent agreement with the Arrhenius activation energy model for the permeation process. AS

Frankfurters

- 2005 Park (H), Rhee (KS) and Ziprin (YA). Low-fat frankfurters with elevated levels of water and oleic acid. *Journal of Food Science* 55(3); 1990; 871-872, 874

The effects of simultaneous incorporation of max. allowable levels of water and high-oleic sunflower oil (HOSO) on frankfurter properties were investigated. The formulation changes generally had little effect on processing yield. Frankfurters formulated with HOSO were 180-241% higher in the ratio of total monounsaturated fatty acids to total saturated fatty acids when compared to control products with similar total fat levels. Consumer-panel sensory data and instrumental texture profile data indicated that low-fat (14-16%), high water, HOSO frankfurters were as acceptable as control frankfurters with 28% fat (all animal fat) and did not have the prettexture problems observed previously with low-fat, HOSO frankfurters without extra added water. AS

- 2006 Resurreccion (AVA) and Reynolds (AEJr). Evaluation of natural antioxidants in frankfurters containing chicken and pork. *Journal of Food Science* 55(3); 1990; 629-631, 654

Three natural antioxidant systems, tocopherol, extract of rosemary, a tocopherol and rosemary combination, and BHA/BHT were evaluated in frankfurters prepared from chicken and pork.

Thiobarbituric acid numbers of refrigerated bulk and vacuum packaged samples stored in darkness for up to 18 days indicated that natural tocopherols provided significantly more protection than controls containing no antioxidant and were as effective as BHA/BHT in retarding oxidation. All bulk packaged frankfurters except those containing BHA/BHT and tocopherols were inedible after 18 days. Colour values indicated no evidence that any treatment provided better colour stability. AS

Ham

- 2007 Spotti (E) and Mutti e Miella Campanini (P). Occurrence of moulds of hams during preripening and ripening. Contamination of the environment and growth of the muscle portion of hams. *Industria Conserve* 64(2); 1989; 110-113 (It).

Sausages

- 2008 Vognolo (GM), De Ruiz Holgado (AP) and Oliver (G). Use of bacterial cultures in the ripening of fermented sausages. *Journal of Food Protection* 52(11); 1989; 787-791

Pure bacterial cultures were used in the production of Argentine salami, the most popular cured meat product in the country. Three selected groups of two strains each of *Lactobacillus plantarum* and *Micrococcus varians* were used as a starter cultures, with two different sugar concn. Apart from the use of these starter cultures, the salami was manufactured under the same conditions normally used in industrial production. When 0.6% sucrose was used, the levels of *L. plantarum* and *M. varians* were 10^8 and 10^7 CFU/g resp., on the second day of ripening. Similar levels of lactic acid bacteria were found in non-inoculated sausages at 2 days post-preparation. Under these conditions, coliforms decreased significantly. The final pH of the inoculated and uninoculated sausage were 5.0 and 5.2, resp., after 7 days of ripening. When 0.9% glucose plus 0.6% sucrose was added, the level of lactic acid bacteria was 10^9 CFU/g on the second day, a value that remained constant in the inoculated sausages to the end of the ripening period. Staphylococci showed a marked decrease in population, while coliforms disappeared on the second or third day. The final pH of 4.40 or 4.55 was reached within 4 days. The product obtained under these conditions had a firm texture, a good slicing surface and pleasant flavour and aroma. The use of starter cultures in cured dry Argentine-style sausage shortened the ripening period from 14 to 7 days. AS

Poultry

- 2009 Carpenter (SL) and Harrison (MA). Fate of small populations of

Listeria monocytogenes on poultry processed using moist heat.
Journal of Food Protection 52(11); 1989; 768-770

The survival of small populations of **Listeria monocytogenes** on poultry processed using a moist heating method₃ was determined. Various inoculum concn. (3.2×10^2 , 4.8×10^3 , and 4.7×10^4) were applied to chicken breasts which were cooked to an internal endpoint temp. of 73.9 C (165 F). After cooking, portions were either vacuum-packaged or wrapped in an oxygen permeable film and stored for up to 4 wk at 4 C or up to 10 days at 10 C. Some **Listeria** survived the cooking process regardless of the inoculum levels. Significant increases ($P < 0.05$) in the **L. monocytogenes** population occurred for each inoculum concn. at both storage temp. within the first sampling period (week 1 for 4 C and day 3 for 10 C). Samples stored at both temp. were able to re-establish themselves to population levels at or above the initial inoculum. No differences were noted due to packaging. AS

- 2010 Lillard (HS). Factors affecting the persistence of **Salmonella** during the processing of poultry. **Journal of Food Protection** 52(11); 1989; 829-832

Bacteria, including **Salmonella**, have been shown to attach firmly to poultry skin and meat. Neither fimbriae, flagella, nor electrostatic attraction seem to play a significant role in the mechanism of attachment. Bacterial cells (95%) were shown to be initially entrapped in a water film on the skin, then to migrate to the skin with prolonged immersion in a bacterial cell suspension. Using electron microscopy it was shown that bacteria appear to be entrapped in ridges and crevices which become more pronounced in the skin and muscle following water immersion. This may make bacteria on carcasses inaccessible to bactericides. It was shown that bacteria are firmly attached to poultry skin before broilers arrive at the plant and that high numbers are still recovered after 40 consecutive whole carcass rinses of a single carcass. It was further shown that **Salmonella** are not always recovered in the first whole carcass rinse and that this method of sampling could result in false negative reports for **Salmonella** incidence. AS

Chickens

- 2011 Ang (CYW), Lillard (HS) and Searcy (GK). Effects of refrigeration and microbial contamination of raw broiler tissues on thiobarbituric acid values and headspace gas chromatographic analysis of cooked and stored breast and leg meat. **Poultry Science** 68(11); 1989; 1470-1477

Paired raw broiler breast and leg muscles were stored at 6 C as control or inoculated samples for 0, 2, 7, or 14 days or

until a near spoilage time of 19 or more days. Treated samples were inoculated with a low count cell suspension (10^5) of normal flora. Samples were cooked and evaluated after 0 and 3-day storage at 4 C before being further evaluated by the thiobarbituric acid (TBA) test and headspace gas chromatographic analysis. Storage after cooking had a positive effect on TBA values and several headspace volatiles. However, both TBA values and major volatiles of cooked, stored meat decreased significantly as the storage time prior to cooking increased. Generally no differences were found between inoculated and control samples for TBA and major volatiles, indicating that microbial contamination of raw, unspoiled tissues prior to cooking was not a factor in the oxidative stability of cooked and stored broiler meat. AS

- 2012 Hassan (IM). Electrophoretic analysis of proteins from chicken after irradiation and during cold storage. *Food Chemistry* 35(4); 1990; 263-276

The SDS/polyacrylamide gel electrophoresis method was tested to determine whether it was suitable for the detection of the pre-irradiation of chicken. The electrophoretic pattern of unirradiated Pectoralis major muscle contained 26 proteins in the range 372391 to 15026 daltons. The radiosensitivities of various proteins in the untreated samples were investigated. Irradiation with 6 kGY caused the complete disappearance of five proteins but induced the appearance of six new proteins as well as considerably altering the mol. wt. (MW) of many proteins. Samples irradiated with 10 and 20 kGy were also distinguishable from either unirradiated or the 6 kGY irradiated samples. At least 19 and 25 new protein fractions were induced upon irradiation with 10 and 20 kGY, resp. Changes in unirradiated and irradiated muscles protein were followed during cold storage at 4 plus or minus 1 C. Slower rates of protein breakdown characterized the higher irradiation doses. At the end of shelf-life of different samples, i.e. 12 (0 kGY), 32 (6kGY), 55 (10 kGY) and 75 (20 kGY) days, the numbers of protein bands were dramatically increased to 48, 46, 48 and 61 resp. All of these bands were characterized by a partially reduced MW. AS

- 2013 Schade (JE), Tsia (L-S), Tong (L), Wilson (R) and MacGregor (JT). Extraction of mutagens from chlorinated poultry chiller water. *Journal of Food Science* 55(3); 1990; 635-639, 657

Poultry chiller water (PCW) was used as a model to study the formation of mutagens that can result from chlorinating water of high organic content. The Ames Salmonella mutagenicity test was used to evaluate solvent extracts of PCW. Pentane gave

satisfactory extraction of mutagens without the emulsion problem encountered with dichloromethane, permitting the use of pentane in continuous extractors. Use of thiosulphate to remove residual chlorine in samples resulted in low mutagenicity. Mutagens were formed within mins of chlorination and continued to change in amount during the next 1-2 h. Mutagen formation was affected by pH and was proportional to chlorine dosage. AS

Broilers

- 2014 Ang (GYW) and Lyon (BG). Evaluations of warmed-over flavour during chill storage of cooked broiler breast, thigh and skin by chemical, instrumental and sensory methods. *Journal of Food Science* 55(3); 1990; 644-648, 673

Broiler breast, thigh and skin were cooked to 80 C, stored at 2 C for up to 5 days, and evaluated by chem., gas chromatographic (GC) and sensory methods. Water and fat content of cooked meat did not change during storage. Thiobarbituric acid (TBA) values and levels of major headspace volatiles increased throughout storage time. Intensities of cardboard, warmed-over, rancid/painty, and overall off-flavour characteristics increased. Skin showed the least changes. Breast and thigh meat differed in GC profiles but were similar in sensory scores after 1 day and in TBA values after 2 days of storage. Both TBA and headspace GC measurements are associated with the off-flavour development. AS

Poultry products

Eggs

- 2015 Ashok Singh.. Egg grading system in poultry. *Poultry Guide* 27(5); 1990; 41-46

A general article dealing broadly with aspects like characters determining the exterior quality of eggs such as shell cleanliness, soundness of shell, size, colour and shape. The interior quality determining factors dealt are the condition of yolk white and the size and condition of the air cell. Also included are the terms descriptive of shell, white, and yolk. KAR

- 2016 Herald (TJ) and Smith (DM). Functional properties and composition of liquid whole egg proteins as influenced by pasteurization and frozen storage. *Poultry Science* 68(11); 1989; 1461-1469

Effects of pasteurization temp. and frozen storage on the functionality and soluble protein comp. of liquid whole egg (LWE)

were studied. Homogenized LWE and LWE heated at 60, 64, or 68 °C for 3.5 min were evaluated during 80 days of storage at -24 °C. Protein solubility decreased by 11% when LWE was heated to 68 °C. Protein solubility decreased 17 and 11% in LWE control and LWE heated to 68 °C, resp., during frozen storage. Polyacrylamide gel electrophoresis was used to monitor changes in soluble protein comp. Percentages of soluble ovotransferrin and globulin proteins decreased during pasteurization and frozen storage. Quality attributes of a pie filling were influenced by pasteurization and frozen storage of LWE. AS

- 2017 Leasor (SB) and Foegeding (PM). *Listeria* species in commercially broken raw liquid whole egg. *Journal of Food Protection* 52(11); 1989; 777-780

Commercially broken raw liquid whole egg (LWE) was obtained from 11 processing establishments across the United States on 3 or 4 occasions over an eight-month period. The samples were evaluated for the presence of *Listeria* sp. by the FDA, USDA, and cold enrichment procedures. Forty-five *Listeria* isolates were obtained from 15 of 42 (36%) egg samples. Both the USDA and FDA methods were useful for isolation of *Listeria* sp., resulting in 12 and 8 positive samples, resp. Six samples were positive by both procedures. *Listeria* was isolated from one sample by cold enrichment. The most frequently isolated sp. was *L. innocua*, which was found in all (15) of the *Listeria*-positive samples. *L. monocytogenes* was the only other sp. isolated and was obtained from 5% (2) of the egg samples. The USDA and FDA procedures each yielded one *L. monocytogenes*-positive samples. The two *L. monocytogenes* positive samples contained estimated populations of 1 and 8 CFU *L. monocytogenes*/ml and were obtained from the same plant during the spring and early summer sampling times. Twelve (80%) of the 15 *Listeria* sp. including the psychrotrophic pathogen *L. monocytogenes*, are present in commercially broken raw LWE. AS

- 2018 Sapkota (D) and Siddiqui (SM). Effect of aging and shell puncturing before cooking on the quality of hard-cooked eggs. *Indian Journal of Poultry Science* 24(4); 1989; 270-276

Eggs were aged for 48 h under ambient (26 °C and 60% RH) and refrigeration (5 °C and 65% RH) separately and punctured before cooking. Physical factors, peeling quality, albumen and yolk characteristics as well as organoleptic quality of hard cooked eggs were evaluated. Ageing under refrigeration gave significantly lesser wt. loss than ageing in ambient condition. Fresh eggs and those aged under refrigeration were most difficult to peel while eggs aged under ambient condition were most easy to peel. Ageing improved peeling but puncturing did not facilitate

peeling of eggs aged for 48 h. Fresh eggs gave the poorest peeling yield and doneness scores. Organoleptic scores were higher for eggs aged under ambient conditions in respect of appearance, flavour, texture and acceptance. KAR

- 2019 Singh (RP) and Panda (B). Comparative study on some quality attributes of quail and chicken eggs during storage. *Indian Journal of Animal Science* 60(1); 1990; 114-117

The quail eggs are as susceptible to quality deterioration as chicken eggs at ambient temp. (32 C plus or minus 2 C). However, the decline in the quality of quail eggs in terms of albumen and yolk indices and percentage of thick white was found to be less than those of chicken eggs under refrigerated (5 C plus or minus 1 C) storage. These results would be of use in working out preservation methods for extended storage and distribution of quail eggs. BV

Egg whites

- 2020 Hamann (DD), Amato (PM), Wu (MC) and Foegeding (EA). Inhibition of modori (gel weakening) in surimi by plasma hydrolysate and egg white. *Journal of Food Science* 55(3); 1990; 665-669, 795

The effects of beef plasma hydrolysate and egg white solids were evaluated in surimi gels using measurements of torsional shear stress and strain, bound water, cook loss and SDS-PAGE. Treatments included level of protein addition, surimi type (by sp. and grade) and cooking schedule. Addition of proteins, regardless of type or level of addition, significantly increased torsional shear stress and strain for all gels precooked at 60 C (90 C final cook). For gels made from low quality surimi, all levels of treatment proteins improved stress and strain for all cooking schedules and improved water holding for gels precooked at 60 C. Electrophoretic results showed a decrease in the density of the myosin heavy chain only in those gels without added proteins precooked at 60 C. AS

- 2021 Kato (A), Ibrahim (HR), Watanabe (H), Honma (K) and Kobayashi (K). Structural and gelling properties of dry-heating egg white proteins. *Journal of Agricultural and Food Chemistry* 38(1); 1990; 32-37

Gel strength of dried egg white greatly increased by heating in the dry state at 80 C. The structural changes responsible for the enhancement of gel strength were studied. Heat-induced gelation of dry heated egg white in the presence of denaturing reagents resulted in a decrease of gel strength in the order SDS > urea > 2-mercaptoethanol. CD spectra revealed only little

changes in the secondary structure of some egg white proteins upon dry-heating, except ovotransferrin. Proteolytic digestibility of ovalbumin and ovotransferrin increased progressively with an increase of dry-heating time, indicating enhancement of protein flexibility by such heating in the dry state. DSC thermograms showed that enthalpy of denaturation (ΔH) of dried egg white was markedly decreased with an increase of dry-heating time. In parallel, the Gibbs free energy of unfolding in water (ΔG) was also found to decrease at approx. the same rate as (ΔH). A good correlation was obtained between the decrease in ΔH and the increase in gel strength of egg white proteins heated in the dry state. AS

Egg yolks

- 2022 Katusin-Razem (B), Dusan (Razem (Matic (S), Mihokovic (V), Kostromin-Soos (N) and Milanovic (N). Chemical and organoleptic properties of irradiated dried whole egg and egg yolk. *Journal of Food Protection* 52(11); 1989; 781-786

The influence of ^{60}Co gamma radiation on the chem. and organoleptic properties of solid whole egg and solid egg yolk has been studied to provide a basis for assessing the feasibility of the radicidation of *Salmonella* in egg powder. Irradiation up to 10 kGy did not produce measurable changes in acidity, vitamins B1 or B2. Radiolytic changes in the fatty component included the decomposition of triglycerides, the formation of hydroperoxides, and the degradation of carotenoids. An increase in hydroperoxidation with dose was coupled with a decrease in carotenoids and vitamin A. Radiolytic decomposition of various amino acids was not random, indicating that the secondary reactions of free radicals from the oxidized lipids were also significant in the selective damage to amino acids. The effects of both lipid and protein fraction could be minimized by irradiating in the absence of oxygen. The organoleptic properties of native egg solids, as well as scrambled eggs and mayonnaise prepared thereof, were indistinguishable from the samples irradiated in air up to 3 kGy, and from samples irradiated in the absence of oxygen up to 5 kGy. AS

SEAFOODS

- 2023 Ackman (RG). Nutritional composition of fats in seafoods. *Progress in Food and Nutrition Science* 13(3/4); 1989; 161-241

This review provides understanding the nature of fats in various seafoods. Aspects covered are proximate comp. of

seafoods, lipid classes in seafoods, fat distribution in fish, salmon the special case, conclusions on fat contents (calories vs capsules) fatty acids (North Atlantic and North Pacific seafoods, Japan, Northern Europe, Australia, South America and South Africa), fresh water fish oils and lipids and cultured vs wild fish. 119 references. SRA

2024 Renon (P), Biondi (PA) and Malandra (R). HPLC formaldehyde research in freezeed crustaceans. *Industrie Alimentari* 28(275); 1989; 956-961 (It).

2025 Shetty (SR). Microwavable package development for frozen seafood. *Packaging India* 22(4); 1989; 11-17

This article discusses microwavable package, what a microwavable package should do, package development, frozen seafood market, microwave energy, how microwaves heat the product and package, product characteristics in package development, quality consideration in package development, marketing consideration in package development, operational needs in package development, problems and opportunities, in microwave package development, microwavable packaging materials, microwave transparent materials, microwave absorbent materials, microwave shielding materials, field intensifying materials, microwavable packages (flexible microwavable packages, microwave safe coated aluminium tray, rigid plastic trays, paperboard container, crystallized polyester, molded pulp container) and safety. SRA

Carps

2026 Watabe (S), Hwang (G-C), Ushio (H), Hatae (K), Yamanaka (H) and Hashimoto (K). Acceleration of physicochemical change in carp muscle by washing in either chilled or heated water. *Journal of Food Science* 55(3); 1990; 674-677, 692

Arai (washing) is a traditional cooking method of fish preparation in Japan. Carp muscle slices were washed in water (40 °C for 15 sec, or 0 °C for 10 min), and examined for physical and biochemical changes. At 49 °C, rigor-mortis was accelerated, resulting in a marked decrease of muscle slice thickness. ATP degradation proceeded faster at 49 °C than at 0 °C. Arai treatment at 49 °C increased myofibrillar Mg^{2+} , -ATPase activity 8-9 times in the absence of Ca^{2+} , but did not affect activity in the presence of Ca^{2+} as much, giving only a 1.2 times increase. AS

Oysters

2027 Sakaguchi (M) and Murata (M). Seasonal variations of free amino

acids in oyster whole body and adductor muscle. *Bulletin of the Japanese Society of Scientific Fisheries* (Nihon Suisan Gakkai-shi) 55(11); 1989; 2037-2041

Seasonal variations in the level of free amino acids (FAA) and nonprotein nitrogen (NPN) were investigated in the whole body and adductor muscle of cultured oyster *Crassostrea gigas*. In the whole body, glutamic acid, alanine, glycine, proline, and beta-alanine were abundant. There were marked seasonal variations in level of almost all FAA with a max. in November to March and with a min. around August, suggesting that the oyster meat is more palatable in winter to early spring than in summer. Taurine was also abundant in the whole body but showed max. and min. levels in June and September resp. In the adductor muscle, arginine was found to be rich in addition to the FAA present in the whole body. The FAA levels exhibited pronounced seasonal fluctuation with a max. in November to April and with a min. in either July or August. Taurine showed a trend similar to that of the whole body. NPN levels in both whole body and adductor muscles peaked in March and came to the bottom in July. AS

Prawns

- 2028 Chen (H-C), Moody (MW) and Jiang (S-T). Changes in biochemical and bacteriological quality of grass prawn during transportation by icing and oxygenating. *Journal of Food Science* 55(3); 1990; 670-673

Live grass prawns (*Penaeus monodon*) were iced or oxygenated in cold water and examined for changes in biochemical and bacterial quality during transportation from the farm to the processing plant. The biochemical quality of oxygenated prawns as assessed by volatile base nitrogen (VB-N), extractable nitrogen (AA-N), VB-N/AA-N ratio, K-value, water holding capacity and sensory results, was superior to that of iced prawn. No distinct differences in inosine 5'-monophosphate (IMP) ratio, nucleotides profile and bacterial contamination between iced and oxygenated samples were observed. AS

Shrimps

- 2029 Sena (C) and Bello (RA). Preparation of shrimp-by catch fish bread spread. *Archivos Latinoamericanos de Nutricion* 38(4); 1988; 865-882 (Es).

The comp. of shrimp by-catch fish from the Central-Western region of Venezuela at different periods of the yr was studied, as well as mean size and wt. of same, and the yields obtained during processing, until the edible portion (pupl) was reached.

The pulp was also analyzed from the physical, chem. and microbiological (pH, basic volatile N, trimethylamine, thiobarbituric acid test, moisture, fat, protein, ashes content and mesophilic and psychrophilic counts) points of view. The purpose of these studies was to determine its quality and freshness, since the pulp was utilized for the preparation of a canned and sterilized bread spread. Results obtained indicated the pulp to have an acceptable freshness, a fact which reflected in a final product with adequate characteristics. The bread spread was also analyzed from the physical, chem., microbiological and sensory viewpoints (objective analyses of colour, and texture, pH, rancidity and sterility tests, moisture, fat, protein, ashes, carbohydrates, NaCl contents, and sensory evaluation). In addition, these analyses were repeated monthly during the three-month storage period at two temp. On the basis of the above mentioned findings, it was possible to determine that the bread spread and adequate acceptability and stability during storage. Further more, raw material variations did not affect the final product characteristics, which resulted in a product with commercial potential. AS

- 2030 Wei (C), An (H), Chen (J-S) and Marshall (MR). Use of modified urea gel isoelectric focusing method for species identification of raw or boiled white, pink, and rock shrimp. *Journal of Food Biochemistry* 14(2); 1990; 91-102

Isoelectric focusing (IEF) polyacrylamide gel containing an 80% pH 4 - 6.5 and 20% pH 3 - 10 ampholyte mixture greatly improved protein banding pattern for sp. identification of water extracts of raw pink, white and rock shrimp compared with the system using only the pH 3 - 10 range ampholyte. Identification of a specific sp. in mixture samples was achieved by the detection of water extractable shrimp specific protein bands present in the gel. Sodium dodecyl sulphate (SDS) was a better protein extractant than water for cooked shrimp. Both water and SDS extracts of cooked shrimp showed specific protein banding patterns and improved resolution for sp. identification. AS

Fish

- 2031 Bhattacharya (S), Das (H) and Bose (AN). Effect of extrusion process variables on microstructure of blends of minced fish and wheat flour. *Journal of Food Science and Technology (India)* 27(1); 1990; 22-28

The effect of the extrusion process variables, such as length/diameter ratio (L/D) of the extruder, comp. of feed temp., of extrusion, and screw speed, on extrudate microstructure, was studied. The extrudates were produced from blends of wheat flour

and partially dried low-cost marine fishes through a single-screw, variable-length extruder-cooker, with a barrel bore of 25 mm. Examination of the extrudates under scanning electron microscope revealed that higher L/D ratio, and incorporation of higher amount of fish in the extruder feed yielded a product with organized fibrous microstructure. These products can be used as an analogue for fish or meat. Expanded fish snacks, on the other hand, could be generated by use of lower L/D ratio or feed ratio. Increase in temp. (100-140 C) helped the texturization process by fibre formation whereas the effect of screw speed (30-90 r.p.m) on extrudate microstructure was not clear. AS

- 2032 Hatae (K), Yoshimatsu (F) and Matsumoto (JJ). Role of muscle fibers in contributing firmness of cooked fish. *Journal of Food Science* 55(3); 1990; 693-696

Cooked muscle tissue of five fish sp. were observed by optical and scanning electron micrography. Sp. with firm texture had thin muscle fibers with considerable heat coagulation material between them, sp. having soft texture had thick muscle fibers with little heat coagulation material. When the cooked muscles were compressed by a texturometer, muscle fibers of the sp. having firm texture slid on shifted over one another to a lesser extent than those of sp. with soft texture. The heat-coagulating material seemed to obstruct the displacement of the fibers. The diameter and mobility of muscle fibers are determinative of firmness of fish muscle tissue. AS

- 2033 Lilly (TJr) and Kautter (DA). Outgrowth of naturally occurring *Clostridium botulinum* in vacuum packaged fresh fish. *Journal of the Association of Official Analytical Chemists* 73(2); 1990; 211-212

A total of 1074 test samples of commercial, domestic vacuum-packaged fresh fish were studied to determine whether spoilage occurs before the products become toxic from naturally occurring *Clostridium botulinum* spores. The products were incubated for 12 days at 12 C (mild abuse). After incubation, they were tested for botulinal toxin and evaluated for organoleptic acceptability. Even when only marginally acceptable to lab. personnel, none of the 1074 test samples were positive for *C. botulinum* toxin. Thus, the fish either contained no *C. botulinum* spores, or the spores were unable to grow out and produce toxin before spoilage made the product marginally unacceptable. AS

Albacore

- 2034 Aubourg (SP), Sotelo (CG) and Gallardo (JM). Changes in flesh lipids and fill oils of albacore (*Thunnus alalunga*) during

canning and storage. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 809-812

Three different parts of the muscle of cooked albacore were canned in soybean oil and stored at room temp. for 11 months. Cans were opened at different times; flesh lipids and fill oils were analyzed for free fatty acid (FFA), sterol (ST), and phospholipid (PL) contents, as well as fatty acid comp. The thermal treatment during the sterilization step produced a decrease in the flesh lipid content and increases in FFA, ST, and PL. Due to canning storage, the lipid content increased significantly after 7-11 months and the FFA and PL amounts decreased. With respect to fatty acid comp., an interaction between the two types of lipids exists. In the flesh lipids a steep increase in fatty acids abundant in fill oil was noticed (18:2, 18:3), and at the same time the characteristic fatty acids of the flesh lipids in fill oil (22:6, 20:5, and others) showed an increase. AS

- 2035 Gallardo (JM), Perez-Martin (RI), Franco (JM), Aubourg (S) and Sotelo (CG). Changes in volatile bases and trimethylamine oxide during the canning of albacore (*Thunnus alalunga*). *International Journal of Food Science and Technology* 25(1); 1990; 78-81

Increases in total volatile bases and loss of trimethylamine oxide were followed through the processing for canning of albacore using three time/temp. conditions. Increases in the bases up to 500 mg/kg were associated with retention of good quality. AS

- 2036 Perez-Villarreal (B) and Pozo (R). Chemical composition and ice spoilage of albacore (*Thunnus alalunga*). *Journal of Food Science* 55(3); 1990; 678-682

The protein, lipid, water and ash contents of the liver and different parts of the muscle tissue of albacore, *Thunnus alalunga*, were measured. Fish were caught at three different seasons and were separated into three size groups for analysis. There were significant differences among the comp. of the tissues size and season also had significant effects. Fish were stored in ice, and scales for the sensory assessment of freshness were developed for raw fish and for cooked meat. Changes in total volatile bases, trimethylamine, and adenine nucleotide decomposition products during storage in ice were measured. Sensory assessments and K index gave the highest correlation with storage time. AS

Hakes

- 2037 Beas (VE), Wagner (JR), Crupkin (M) and Anon (MC). Thermal denaturation of hake (*Merluccius hubbsi*) myofibrillar proteins. A differential scanning calorimetric and electrophoretic study. *Journal of Food Science* 55(3); 1990; 683-687, 696

Denaturation of hake (*Merluccius hubbsi*) proteins was studied with DSC by monitoring T_{max} of transitions and denaturation enthalpies. Whole muscle free of connective tissue showed two transitions (T_{max} 46.05 C and 75.3 C), and Delta H of 4.27 cal/g. The exudative sarcoplasmic fraction showed three transitions (T_{max} 45.2 C, 59.0 C and 75.5 C) and Delta H of 3.92 cal/g. The sarcoplasmic proteins from whole hake muscle contributed to both denaturation peaks. Muscle depleted of sarcoplasmic proteins by chloride extraction showed a higher thermal sensitivity and a diminished denaturation enthalpy on the second transition. This suggested an additional effect of chloride upon actin in addition to sarcoplasmic protein extraction. pH had an effect upon the native conformation of thick filament proteins, specifically myosin. AS

- 2038 Dondero (M), Santibanez (MA), Tarkey (W), Curotto (E) and Canto (M). Protein denaturation in frozen hake (*Merluccius gayi gayi*). *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 230-238 (Es).

Protein denaturation was studied in hake (*Merluccius gayi gayi*) during frozen storage at -28 C plus or minus 1 C and at -19 C plus or minus 1 C for thirteen and seven wks resp., using an in vitro and in situ model tests. The decrease in actomyosin solubility and in calcium ATPase activity confirmed that protein denaturation occurred both during the freezing process and during the frozen storage. Hake proteins appeared to be more resistant freeze denaturation in situ than in vitro. The addition of sodium glutamate by using an in vitro model test showed its preventive effect on the freezing denaturation for eight wks at -28 +1 C. Frozen samples were rejected by the panelists after twenty wks of frozen storage. AS

- 2039 Gonzalez Badano (RM). Comparative study on the chemical composition, amino acid content and nutritive value of fresh and frozen, and salted, dried and rehydrated hake. *Archivos Latinoamericanos de Nutrición* 38(2); 1988; 330-344 (Es).

The EDU values (enzymatic ultrafiltrate digest) in all three types of samples and the nutritional value of the hake was determined after each process. The main purpose of this study was to evaluate the influence of the freezing, on the one hand,

and salting/drying processes on the other, on the nutritional value of the hake. Data on the chem. comp. of fresh, quick-freezing, and salted/dried/rehydrated hake filets is given, as well as data on the mineral comp., identification of fatty acids in the lipidic extract, and amino acid comp. of their proteins. AS

- 2040 Montero (P), Borderias (J), Turnay (J) and Leyzarbe (MA). Characterization of hake (*Merluccius merluccius* L.) and trout (*Salmo irideus* Gibb) collagen. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 604-609

An analysis of the different types of collagen present in various body structures, the amino acid comp. of the collagen, and the degree of collagen aggregation for hake and trout is presented. Type I collagen was found at all body sites, and its amino acid profile and degree of hydroxylation are considered. Hydroxyproline values, the ratio of hydroxyproline to the other amino acids, and the proportions of alanine, tyrosine, and methionine are also discussed. Values for collagen solubility in salt and acid indicated a lower insolubility rate for skin collagen than for muscle collagen. The proportions of the alpha-, beta-, Gamma- components in the acid-soluble fractions of skin and muscle collagen are also examined; the proportion of Gamma-components is lower in hake muscle collagen than in hake skin collagen, whereas the converse holds true in trout. AS

Herring

- 2041 Kent (M). Measurement of dielectric properties of herring flesh using transmission time domain spectroscopy. *International Journal of Food Science and Technology* 25(1); 1990; 26-38

The dielectric properties of herring (*Harengus harengus*) flesh were measured over a frequency range from 0.1 to 10 GHz using a transmission time domain spectrometer. The relationships between the various components of the complex permittivity and comp. in terms of water, fat and ash are discussed as a basis for a rapid measurement technique. AS

Mackerels

- 2042 Haaland (H), Arnesen (E) and Njaa (LR). Amino acid composition of whole mackerel (*Scomber scombrus*) stored anaerobically at 20 °C and at 2 °C. *International Journal of Food Science and Technology* 25(1); 1990; 82-87

Total amino acid comp. of whole mackerel (*Scomber scombrus*) and of milt and roe from mackerel stored at different conditions

were studied. During storage at low temp., no obvious changes were found. When stored at high temp. (20 °C) the content of several of the amino acids decreased, and phenylethylamine, tyramine, putrescine, histamine and cadaverine were formed; the formation of cadaverine was higher than the loss of lysine. AS

- 2043 Maruf (FW), Ledward (DA), Neale (RJ) and Poulter (RG). Chemical and nutritional quality of Indonesian dried-salted mackerel (*Rastrelliger kanagurta*). *International Journal of Food Science and Technology* 25(1); 1990; 66-77

Indonesian mackerel (*Rastrelliger kanagurta*) were sun dried or salted and sun dried and stored at 30 °C for up to 20 wks in air. During processing and storage polyunsaturated fatty acids oxidized to form thiobarbituric acid (TBA) reactive substances and fluorescent compounds. TBA values increased with increasing salt content (range 2.3-20.7%). Positive, highly significant correlations were found between the odour of the stored products and both fluorescent pigment production and the degree of browning. Amino acid analysis indicated loss of lysine, glutamic acid, serine, histidine, arginine and the sulphur containing amino acids, but these losses were far too small to account for the massive decreases found in net protein utilization (NPU) of the stored products, measured by rat-feeding trials. The latter were highly correlated with the fluorescent pigment content and degree of browning in products of intermediate (-14%) salt content. AS

Sardines

- 2044 Fujii (T), Hirayama (M), Okuzumi (M), Yasuda (M), Nishino (H) and Yokoyama (M). Shelf life studies on fresh sardine packaged with carbon dioxide nitrogen gas mixture. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(11); 1989; 1971-1975 (Ja).

Changes in the sensory quality, K-value, 2-thiobarbituric acid (TBA) value, trimethylamine (TMA), pH and viable bacterial number were examined for sardine (*Sardinops melanostictus*) packed under air, 20% carbon dioxide -80% N (v/v) and 80% carbon dioxide, 20% N in plastic bags with low gas permeability, stored at 5 °C. Shelf life was affected mainly by development of rancidity, samples packed under modified atm. had double the shelf life of samples packed under air. The TBA number had high correlation with sensory analysis of the samples while K-value showed no significant differences. Level of TMA decreased with increase in carbon dioxide concn. 80% carbon dioxide atm. inhibited the growth of aerobic bacteria in the samples, while the inhibition was not significant in the samples packed under

20% carbon dioxide. Anaerobic bacteria were little affected by carbon dioxide. SGB

Sol

- 2045 Niwa (E), Yamada (H), Kanoh (S) and Nakayama (T). Thermal behaviour of actomyosin subunits during setting of salted fish flesh sol. *Bulletin of the Japanese Society of Scientific Fisheries (Nihon Suisan Gakkai-shi)* 55(11); 1989; 1997-2000

A feeding exp. was conducted to characterize essential fatty acid deficiency and to determine the effect of dietary n-6 and n-3 fatty acids on growth and histological changes of white fish *Coregonus lavaretus maraena*. Growth, feed efficiency together with survival rate were lowest in fish fed a diet containing 5% 18:1n-9 as a sole lipid source. On the otherhand, all parameters were effectively improved by supplementation with n-3 fatty acids, and were highest in fish receiving the diet containing n-3- highly unsaturated fatty acids (HUFA) greater than 0.5%. However, 18:2n-6 was found to be ineffective for enhancing growth. Addition of 18:2n-6 to 18:3n-3 did not further improve growth and feed efficiency. The fish fed the 18:1n-9 diet showed swollen pale livers with abnormalities in histological analysis. This abnormal histological condition was improved by supplementation of 0.5% n-3 HUFA. The ratio of 20:3n-9 to 22:6n-3 in the fatty acid comp. of polar lipid fractions from the liver, one of the EFA indices for freshwater fish, was highest in the EFA-deficient group and lowest in the fish receiving 1:n-3 HUFA in diet. These results indicate that n-3 fatty acids are essential for white fish. AS

Tunas

- 2046 Chen (C-M), Wei (CI), Koburger (JA) and Marshall (MR). Comparison of four agar media for detection of histamine producing bacteria in tuna. *Journal of Food Protection* 52(11); 1989; 808-813

In a comparative study to determine their effectiveness for early detection of prolific histamine-producing bacteria from tuna samples. Niven's medium proved to be superior to three modifications of the medium. Presumptive colonies could be detected in 24 h on Niven's agar surface-plated and incubated at 35 C. Following confirmatory histamine detn. with high performance liquid chromatography of the tuna fish infusion broth inoculated with presumptive histamine-producers and non-producers, detection rates of 95.8 and 93.9% were obtained from temp. abused and bacteria-spiked tuna samples, resp., using Niven's agar. The other three modifications provided much lower detection rates and higher false-positive and false-negative

results than did Niven's agar. AS

Products

Fish

- 2047 Hsu (SY). Effect of frozen storage and other processing factors on the quality of surimi. *Journal of Food Science* 55(3); 1990; 661-664

A split plot design was applied to study the effect of frozen storage on the quality attributes of surimi. Gel strength of surimi products was shown to be significantly ($P < 0.01$) affected by storage and its three-way or lower order interactions with leaching, grinding, setting and heating processes. Whiteness of the fish sausages was significantly ($P < 0.01$) affected by storage and its interactions with leaching, grinding and heating processes. Significant interactions of storage with other process variables implies that the conventional single-variable at a time strategy is inadequate to optimize the surimi processing system. Storage conditions should be included in optimization. AS

- 2048 Manthey (M). Content of sodium, potassium, iodine and fluoride in fishery products. *Deutsche Lebensmittel-Rundschau* 85(10); 1989; 318-321 (De).

The content of Na, K, I and fluoride, was determined in selected fishery products. Convenience food was analyzed raw and boiled. Processing increased the sodium content distinctly (canned herring 400-700, marinated and salted products: 100-6500, fish sticks/fishburgers; 190-650; mg/100 g edible product, resp.). K (70 - 430 mg/100g) was almost not influenced. The main source of the Na content in deep frozen convenience fish products were the vegetables and/or sauces and the coating of fish sticks. No differences were found in the I content of raw and processed fish (50-240 g/100 g). The processing of fish with skin and bones increased the amount of fluoride in products like canned sardines and sprats. AS

PROTEIN FOODS

- 2049 Segura (EV), Mahecha (GL), Moreno (BES) and Rodriguez (GS). Development of an infant food product based on rice. *Archivos Latinoamericanos de Nutricion* 38(2); 1988; 278-287 (De).

An infant dehydrated rice-based food product, complemented

with soybean flour, was developed. To improve its nutritional and organoleptic characteristics, fruits were also added. Ingredients were first precooked and dried in a drum-dryer, obtaining a final product, as flakes, with a 2 to 3% water content. This rehydrates easily with liquids such as milk, water or "panela" (refined and concentrated sugar cane syrup). The sensory panel did not detect any difference between formulations containing 10, 15 and 20% soybean, resp. AS

Infant foods

- 2050 Barbeau (WE). Nutritional evaluation of experimental weaning food prepared from green leaves, peanut oil, and legume flour. *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 381-392

The present investigation was undertaken to assess the feasibility of increasing the energy density of weaning foods through the incorporation of gels made from leaf protein and peanut oil. The protein content and amino acid score of these weaning foods was also determined in order to assess their ability to meet the protein requirements of growing infants. Yields from starting materials ranged from 29 to 99%. Highest yields were obtained when 20% legume or oilseed flour was incorporated into leaf protein-peanut oil gels. The moisture content of the weaning foods ranged from 42 to 65%, protein from 3.4 to 6.5% fat from 23 to 48% and carbohydrate from 3 to 13%. Proteins in the experimental weaning foods were found to be deficient in the sulphur amino acids. Amino acid scores for weaning foods containing 20% legume or oilseed flour ranged from 50 for mung bean to 62% for soy. It was estimated that a flour-ounce daily serving of one of the soy-weaning foods would supply 40% of energy and 35% of the protein needs of a one-year old infant. SRA

- 2051 de Leon (JM), Wiechers (RG), Villalobos (ME) and Rodriguez (HB). Development of an infant food product based on fermented milk, cereals and soybean. *Archivos Latinoamericanos de Nutricion* 38(4); 1988; 852-864

The objective of this work was to develop an infant food product based on yoghurt, cereals and soybean. The experimental conditions to obtain the yoghurt using milk and lyophilised microorganisms, were: incubation period, 5 h, a temp. of 41 plus or minus 1 C and inoculum concn. 3%. Two protein mixtures were prepared 1) corn-yoghurt, with a protein supply relation of 65/35%, and 2) wheat-soy-yoghurt with a protein supply relation of 20/60/20 %, resp. The mixtures were fermented during 24 h at 37 C and spray-dried thereafter. Artificial flavours, sugar and

maltodextrins were added to the final product, in order to develop an instant puree. The protein content of the product was 11%, with a net protein utilization (NPU) of 80% in relation to casein. Banana was the most acceptable flavour. This type of product represents an alternative to preserve milk in developing countries, obtaining suitable baby food products. AS

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

Alcoholic beverages

Beer

- 2052 Gorintin (S), Moshe (R), Wolfe (FH), Berlinder (M), Rotenstreich (A) and Tilis (K). Characterization of stabilized and unstabilized beers. *Journal of Food Biochemistry* 14(2); 1990; 161-172

The preparation and properties of polyvinylpolypyrrolidone (PVPP) and silica gel and the mechanisms by which they stabilize beer are discussed. In stabilized beer, chill stability was associated with lower protein sensitivity to precipitation with tannins. Approx. 60% of the proteoses were of low mol. wt. (< 10,000 daltons). The most acidic of these proteoses were the least stable in solution, being precipitated from beer by cold treatment and adsorbents. AS

- 2053 Kaneda (H), Kano (Y), Kamimura (M), Osawa (T) and Kawakishi (S). Detection of chemiluminescence produced during beer oxidation. *Journal of Food Science* 55(3); 1990; 881-882

Chemiluminescence (CL) produced in beer was detected using the single photoelectron counting system. CL production did not occur in a nitrogen atm. but did occur in air and was dependent on incubation temp. It was inhibited by the addition of ascorbic acid. CL analysis should provide useful information in the study of oxidative deterioration of beer. AS

Malt

- 2054 Singh (T). Flow behaviour and functional properties of malt extract concentrates. *Journal of Texture Studies* 20(4); 1989; 479-497

Flow characteristics and functional properties of malt extract conc. were investigated. Flow behaviour was studied using a coaxial viscometer over shear rates of 0.6-145.8 s^{-1} .

The shear rate-shear stress data followed the power law, Casson, Herschel-Bulkley and Bingham plastic models. Herschel Bulkley values for flow behaviour index which ranged from 0.73-0.94, and presence of yield stress indicated the Bingham plastic nature of malt extract conc. The activation energy of flow for various conc. was in the range of 14.8-17.7 kcal/g mole. Magnitudes of Reynold numbers (0.0-49.9) for all conc. were lower than 2100. Temp. yield stress and plastic viscosity considerably influenced the flow of conc. in straight pipes. The pressure drop and power requirements for flow of conc. in pipes at 50 C, 60 C were lower than those at 30 C, but negligibly different from those at 80 C. Coeff. of correlation between the Bingham plastic values for pressure drop and yield stress ($r = 0.86$, $P < 0.01$) and plastic viscosity ($r = 0.97$, $P < 0.01$) were highly significant. Hulled barley and corn conc. containing high amounts of reducing sugars, showed low viscosities and yield stresses, and required desirably low power for flow in pipes at 50-60 C. The high protein conc. of wheat and triticales malts showed high whip vol. and good foam stability. Wheat conc. was superior in fermentability. Hulless barley and finger millet malts produced conc. with high viscosities which might facilitate their utilization in gums, candies and other such products. AS

Wines

- 2055 Ulla (MC), Vidal (MC) and Marine (A). Tyramine and tyrosine during the wine-making process. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 221-229 (Es).

The evolution of tyrosine and tyramine during the wine-making process of three types of wine (white, rose and red) was studied with the objective of checking the possibility of a correlation between the levels of both substances during this process. The levels of tyramine found in the studied wines have been very low. The highest level has been found in the white wine (0.9 p.p.m.). The evolution of this amine was similar in the three cases. The evolution of tyrosine, however, has been found to be different in the three wines, the levels of this amino acid being higher than the tyramine ones. Because of these differences of levels, the observed oscillation in both amino acid and amine contents during the wine-making process are not directly comparable. Due to this reason, a direct transformation of the amino acid into the amine can not be shown. However, it can be stated that the major formation of tyramine was produced during the alcoholic fermentation. AS

Non-alcoholic beverages

- 2056 Dodd (NS) and Gupte (M). Carbohydrate content and composition of

selected beverages. **Journal of Food Science and Technology (India)** 27(1); 1990; 68-69

High performance liquid chromatography was used for identification and quantitation of sugars. The sugars identified in carbonated beverages and fruit based beverages were mainly glucose and fructose. Sucrose was also identified in some carbonated beverages and it was the predominant sugar in fruit based beverages. Glucose was the predominant sugar in most carbonated beverages where its concn. ranged from 3.4 to 7.6 g/100 g. Milk based beverage contained only lactose and sucrose. The total sugar content of fruit based beverages was significantly higher than carbonated and milk based beverages. AS

Coffee

- 2057 Rangaswamy (JR). Spectrophotometric method for determination of phosphine residues in coffee seeds. **Journal of Food Science and Technology (India)** 27(1); 1990; 33-37

A method for detn. of phosphine residues on/in coffee seeds has been developed based on the reaction of phosphine with silver nitrate in 2% aqueous methanol. The linear relationship between absorbance of egg yellow chromophore and concn. of phosphine is obeyed between 0.025 and 0.2 μg phosphine in 3 ml solvent. Phosphine residue in fumigated coffee seeds is determined by soaking 10 g sample in 15 to 30 ml solvent for one hr and the absorbance at 410 nm of the filtrate is read against the crop control blank of the same sample size. The method is sensitive with lower detectable and estimatable limits of 0.01 and 0.025 μg phosphine resp. Recovery of added phosphine from a closed system is 95%. AS

- 2058 Rangaswamy (JR) and Sasikala (VB). Suitability of phosphine for coffee bean fumigation and its residues during storage. **Journal of Food Science and Technology (India)** 27(1); 1990; 38-44

At a dose of 3 aluminium phosphide tablets/ton free phosphine residue in coffee beans is just half of that found in the round pea berry. Coffee beans (0.097 p.p.m.) is free of phosphine, residue at 20 days compared to that in the pea berry (0.176 p.p.m.) which takes 33 days. Decrease of computed residues from coffee beans is faster (14 days) than that from the pea berry (26 days). Coffee beans have higher phosphine holding capacity than the pea berry var. In its initial pattern of phosphine desorption, coffee resembles wheat. Coffee beans and pea berry dosed at 6 AIP tablets/ton had desorbed larger amounts of phosphine than those dosed at 3 tablets/ton. Even at this higher dose, both coffee beans and the peaberry var. are free of

phosphine residue within 34 days. Absorption spectra of these fumigated coffee var. reveal the absence of any bound residues of phosphine. Air oxidation of phosphine to P compounds is predominant in coffee beans. Coffee beans can safely be fumigated at 3 AIP tablets/ton without having traces of either free or bound residues of phosphine. AS

- 2059 Speer (K) and Montag (A). 16-O-methylcafestol-a new diterpene in coffee. 1. Contents in raw and roasted coffees. *Deutsche Lebensmittel-Rundschau* 85(2); 1989; 381-389 (De).

Based on the results presented here, it can be said that 16-O-methylcafestol is an unequivocal indicator for robusta coffees both raw and roasted. For the first time it has become possible to reliably trace even low percentage of robusta coffee in arabica roast coffee mixtures. This is of definite interest, since so far it was not possible to check on statements like "pure arabica coffee" or "pure upland coffee" by means of sensorial or chem. indices and to evaluate them from a legal standpoint. AS

Fruit juices

- 2060 Bushway (RJ), Savage (SA) and Ferguson (BS). Determination of methyl 2-benzimidazolecarbamate in fruit juices by immunoassay. *Food Chemistry* 35(1); 1990; 51-58

A modified enzyme immunoassay method has been developed to determine methyl 2-benzimidazolecarbamate (MBC), the degradation product of benomyl, in fruit juices and conc. The analysis is complete within 30 min and up to 8 samples can be run simultaneously. Samples are quantified using a hand-held battery-powered photometer which makes possible analysis in processing and quality-control lab. MBC concn. is linear from 1 to 26 ng/g (100 to 2600 pg/tube). For juices > 26 ng/g, dilutions must be made. The lower limit of detection was 10 ng/g p.p.b. for juices and 30 ng/g for conc. Percent coeff. of variation (% CV) ranged from 16.6 to 4.5 for standards and 25.0 to 12.0 for samples. Agreement between this method and high-performance liquid chromatography (HPLC) was good. AS

- 2061 Chen (CS). Mathematical correlations for calculation of Brix-apparent density of sucrose solutions. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 154-156

On the basis of Archimedes principles, an equation for conversion of true density to apparent density of sucrose solutions, at 20 C was obtained. The calculated results were accurate to plus or minus in the fifth decimal of the apparent

density data published by the U.S Bureau of Standards. This equation can be used in computer programming to develop computerized Brix tables and to calculate apparent density values at various concn. for mechanization of fruit juice industrial applications. AS

- 2062 Friedman (M), Wilson (RE) and Irving Ziderman (I). Effect of heating on mutagenicity of fruit juices in the Ames test. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 740-743

Mutagenic responses of freshly squeezed orange juice, fresh orange juice heated for 0.5-30 min at 100 C, and several commercial orange juices were investigated in four bacterial strains of *Salmonella typhimurium* (TA98, TA100, TA102, TA2637) with and without microsomal activation. The response without activation was similar in all cases, ranging 2-3 times the background values. The exp. with microsomal activation produced barely visible pinpoint colonies that do not appear to be normal revertants. Our results do not duplicate previously reported high mutagenic activity of fresh orange juice after heating, or of commercial var. In preliminary studies, no increase in the number of revertants was apparent after freshly prepared apple, grape, and pear juices were heated. The possible chem. basis for the mutagenic and antimutagenic activities of fruit juices is discussed. AS

- 2063 Hong (V) and Wrolstad (RE). Characterization of anthocyanin-containing colourants and fruit juices by HPLC/ photodiode array detection. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 698-708

The anthocyanin pigment profiles of commercial black currant, blackberry, black raspberry, elderberry, cherry, plum, grape, bilberry, and red cabbage products were characterized by high performance liquid chromatography (HPLC)/photodiode array detection. Removal of acylated anthocyanins by alkaline hydrolysis and selective removal of anthocyanins on a reversed-phase cartridge with borate buffer were auxiliary techniques that proved helpful in making peak assignments. Both the retention properties on reversed-phase HPLC and the spectral properties by photodiode array detection were used to characterize the anthocyanins. Other properties including tinctoral strength, total anthocyanin concn., browning, titratable acidity, and Hunter tristimulus values were also determined for these colourants. AS

Apple juices

- 2064 McDaniel (MR), Lederer (CL), Flores (JH) and Heatherbell (DA).

Effect of sulphur dioxide and storage temperature on the sensory properties of clarified apple juice. *Journal of Food Science* 55(3); 1990; 728-730, 745

'Red Delicious' apple juice was processed by ultrafiltration (UF) with sulphur dioxide (min. oxidation) and without sulphur dioxide (max. oxidation) and stored for 12 months at 2 C or 20 C. After storage, a trained panel evaluated the juices descriptive analysis. The treatments (plus or minus sulphur dioxide at 2 C and 20 C) were analyzed for pH, total acidity, soluble solids, free sulphur dioxide and total phenols. A sharp decline in total phenols in the treatments without sulphur dioxide indicated that oxidation has occurred. Apple juice with min. oxidation (+ sulphur dioxide) was scored significantly higher in fresh apple aroma than the oxidized juice (-sulphur dioxide). Juice stored at 20 C was significantly less estery and stronger in chemical off-odour than juice stored at 2 C. AS

- 2065 Mitek (M) and Drzazga (B). Interrelation between the effect of enzymatic clarification of apple juices and the amount and quality of polyphenols. I. Inhibition of pectinolytic enzymes by polyphenols. Studies of model systems. *Acta Alimentaria Polonica* 14(2); 1988; 175-185

The effect of 15 polyphenolic compounds on the activity of polygalacturonases and pectinesterase contained in selected pectinolytic preparations (Pectopol PT, Pectinase and Panzym Super) was studied. The tests performed in model systems demonstrated that all the investigated polyphenolic compounds with the exception of chlorogenic, caffeic and protocatechuic acids inhibit the activity of both polygalacturonases and pectinesterase. The strongest enzyme inhibitors among the considered polyphenols were dl-catechol, apigenin, koempferol, quercitrin, quercetin as well as m- and p-coumaric acids. Ferulic acid inhibits pectinesterase activity fairly substantially but has no inhibitory effect on polygalacturonases activity. AS

- 2066 Schwartz (M) and Costell (E). Influence of temperature and concentration on the viscosity of apple and grape juices. *Revista de Agroquímica Y Tecnología de Alimentos* 29(2); 1989; 239-245 (Es).

The influence of temp. and concn. on the viscosity of apple and grape juices were studied. The study was carried out at 20, 30, 40 and 50 C and the samples concn. ranged between 30 and 72 Brix in apple juice and between 20 and 66 Brix in grape juice. Variations of eta with temp. followed Arrhenius relationship (r greater than or equal to 0.945) in both products. At Brix

greater than or equal to 50, activation energy values (E_a) were slightly higher for apple juice and at lower Brix E_a values for both apple and grape juices were similar (4.45 less than or equal to E_a less than or equal to 4.85 Kcal/mol). Change of η with concn. fitted well to an exponential model (r greater than or equal to 0.950) in both products. AS

Pear juices

- 2067 Spanos (GA) and Wrolstad (RE). Influence of variety, maturity, processing and storage on the phenolic composition of pear juice. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 817-824

The influence of sulphur dioxide, initial high-temp. short-time (HTST) heat treatment, enzymatic clarification, fining, bottling, concn., and storage on the phenolic comp. of pear juice pressed from "hard" and "soft" Comice, d'Anjou, and Bartlett fruit was studied by means of HPLC with diode array detection. Variety and maturity introduced major quantitative differences in the phenolic profile. Considerable loss of cinnamics and total disappearance of procyanidins occurred in the juices processed without sulphur dioxide. Initial HTST treatment protected cinnamics and procyanidins from degradation during processing. Hydrolysis of cinnamics occurred during enzymatic clarification of juices; this hydrolytic acidity ceased with bottling. There was no apparent reduction of phenolics with fining. Procyanidins were sensitive to the heat applied during bottling and concn. Arbutin and flavonol glycosides were less affected by sulphur dioxide and processing. Storage of conc. for 9 months at 25 °C resulted in formation of low levels of (hydroxymethyl) furfural, extensive degradation of cinamics and flavonol glycosides, and total loss of procyanidins. AS

Plum juices

- 2068 Wani (MA), Saini (SPS) and Bains (GS). Physico-chemical changes during preparation of plum juice concentrate. *Journal of Food Science and Technology (India)* 27(1); 1990; 29-32

Pulp and juice from three plum var. were subjected to concn. in a glass evaporator at 50-60 °C under vacuum of 27-30 inches of mercury. The plum pulp could not be concentrated beyond 26 Brix, while the juice was done to 73 Brix. An increase in total soluble solids, total solids, reducing sugars, browning and viscosity was observed with negligible decrease in acidity and pectin during concn. process. AS

Tea

- 2069 Hara (Y) and Watanabe (M). Antibacterial activity of tea polyphenols against *Clostridium botulinum*. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 951-955 (Ja).

The present exp. reports the min. inhibitory concn. (MIC) of each tea polyphenolic component against spores and vegetative cells of *C. botulinum* was determined. As tea polyphenols, "crude catechins" and "crude theaflavins" were separated. These crude substances were further purified into each four catechins and theaflavins. Catechins and theaflavins were mixed at graded concn. with TGC medium to make the test medium. Spores (5×10^2) were mixed with above test media anaerobically in pouches. Vegetative cells were preincubated and streaked on the solidified test medium. All these samples were incubated anaerobically at 30 C for 3 days to find out the growth inhibitory concn. As a result, several hundred p.p.m. concn. of crude catechins, gallated catechins and all theaflavin fractions inhibited the growth of both spores and vegetative cells of *C. botulinum*, duly supporting the validity of the previous paper. The same exp. were done with some other heat tolerant bacteria with convincing but unpredictable results. AS

- 2070 Hara (Y) and Ishigami (T). Antibacterial activities of tea polyphenols against foodborne pathogenic bacteria. *Journal of the Japanese Society of Starch Science* 36(12); 1989; 996-999 (Ja).

Min. inhibitory concn. (MIC) of polyphenolic components of tea against well known 16 strains of foodborne pathogenic bacteria was determined. As tea polyphenols, "crude catechins" from green tea extract and its four components, and "crude theaflavins" from black tea extract and its four components were used. The results showed that these tea polyphenols had antibacterial activities against *Vibrio parahaemolyticus*, *V. fluvialis*, *V. metschnikovii*, *Staphylococcus aureus*, *Clostridium perfringens*, *Bacillus cereus*, *Plesiomonas shigelloides*, and *Aeromonas sobria*. But they hardly had the activities against *A. hydrophila* subsp. *hydrophila*, *Salmonella enteritidis*, *S. typhimurium*, enteropathogenic *Escherichia coli*, enteroinvasive *E. coli*, *Yersinia enterocolitica*, *Campylobacter coli*, and *C. jejuni*. AS

- 2071 Owuor (PO), Gone (FO), Onchiri (DB) and Jumba (IO). Levels of aluminium in green leaf of clonal teas, black tea and black tea liquors, and effects of rates of nitrogen fertilizers on the aluminium black tea contents. *Food Chemistry* 35(1); 1990; 59-68

Clonal teas have different Al content increasing with age of

leaf. Although Al and fertilizer N enhance tea growth and tea yields resp., field trials have shown no relationship between total Al content in the leaf and clonal tea yields. Higher Al concn. were found in the dust grades of black tea than in the large size grades. However, Al levels decreased in the tea liquor from dust grades compared to the large size grades. Only up to 40% of the total Al in tea was infused into tea liquors; the amounts infused varied with clones and grading(sorting). Al content of black tea was lowered by increasing rates of N fertilizers, more frequent applications, and application of NPK 20:10:10 as opposed to NPKS 25:5:5:5. AS

FATS AND OILS

- 2072 Alhir (S), Markakis (P) and Chandan (RC). Lipase of *Penicillium caseicolum*. Journal of Agricultural and Food Chemistry 38(3); 1990; 598-601

The lipase activity of *Penicillium caseicolum* was tested in a cell-free broth of the organism and in a partially purified preparation of the enzyme. The optimum reaction pH of the enzyme was 9.0 and the optimum temp. 35 C. A mixture of CaCl and sodium taurocholate enhanced the activity of the enzyme toward butter oil. The heat inactivation of this lipase was exponentially related to temp. A z value of 16 C and an inactivation energy of 32 200 cal/mol were calculated for this enzyme. Triglycerides of lower mol. wt. fatty acids were better substrates than those of higher mol. wt. fatty acids for this lipase. AS

- 2073 Capar (SG). Determination of copper, iron, and nickel in oils and fats by direct graphite furnace atomic absorption spectrometry. Summary of collaborative study. Journal of the Association of Official Analytical Chemists 73(2); 1990; 320-321

A collaborative study of a method for the detn. of Cu, Fe, and Ni in edible oils and fats by direct graphite furnace atomic absorption spectrometry was recently conducted by the International Union of Pure and Applied Chemistry. The quantitation limits of the method are 5 µg/kg for Cu and 10 µg/kg for Fe and Ni. The method has been adopted official first action as an IUPAC-AOAC method. AS

- 2074 Dobarganes (MC), Perez-Camino (C) and Marzuez-Ruiz (G). Polar compounds determination in frying fats and oils. Grasas y Aceites 40(1); 1989; 35-38 (Es).

In connection with the new regulation of heated fats, in this paper the main characteristics of frying fats and the need for their quality control are considered. The results obtained for polar compounds from the analysis of 140 samples are discussed. AS

Fats

Butter

- 2075 Rohm (H) and Ulberth (F). Use of magnitude estimation in sensory texture analysis of butter. *Journal of Texture Studies* 20(4); 1989; 409-418

Sensory detn. of butter texture properties is usually done with category scales. The present study was undertaken to evaluate the applicability of the magnitude estimation procedure. To obtain individual stimulus-response-functions, butter of different temp. was assessed sensorically for spreadability and hardness by means of a trained panel. In instrumental measurements were done with four empirical methods (apparent yield value; extruder; force penetration; sectility). Excellent exponential relationships were achieved between magnitude estimation and instrumental values. Due to individual responses, differences constants in the power law equations were found. A second exp. showed that spreadability can be evaluated best by apparent yield value whereas sensory hardness is imitated by sectility testing. AS

Vanaspathies

- 2076 Murthi (TN), Devdhara (VD) and Jacob (G). Determination of vitamin A in vanaspathi by high pressure liquid chromatographic method using U V detector. *Journal of Food Science and Technology (India)* 27(1); 1990; 1-3

Vitamin A is extracted from a few mg of vanaspathi with isopropanol and it is satisfactorily separated as a peak by a rapid liquid chromatographic (HPLC) method within 5 min. The extraction of vitamin A from the fat phase is complete and it

can be determined by this method without further clean up and saponification procedures at as low as 3 I.U./g. The vitamin A contents of vanaspathi samples were found to be 22 to 25 I.U./g. AS

Oils

- 2077 Abou (AMF), Kotb (AR) and Daniels (CEJ). A data processing method for the determination of the concentration of the components of unsaponifiable matter in vegetable oils. *Food Chemistry* 35(3); 1990; 167-178

A simple method of data processing was developed for detn. of the components of unsaponifiable matter in vegetable oils. Gas-liquid chromatography (GLC) was applied to the direct analysis of a sample of unsaponifiable matter as a whole, and to preparative thin-layer fractions of the same sample. The data obtained by both methods were manipulated to determine calculation factors for the different thin-layer chromatography (TLC) groups of the unsaponifiable matter, and these factors were used to quantify the individual components of each group. Identification of the components was achieved by comparison of $R_{f/v}$ values (R_{tft}) and retention times (R_{vtv}) and those of standard substances separated simultaneously by the same techniques. The identity of the components was confirmed by combined GLC-mass spectral analysis of the same preparative TLC fractions, and a comparison of R_{vtv} and m/e data with those of standard substances. The new method was applied to the detn. of the concn. of squalene, alpha-tocopherol, gamma-tocopherol, sesame and sesamolene (together), obtusifoliol, gramisterol, citrostadienol, beta-amyrin, cycloartenol, 24-methylenecycloartanol, cholesterol, brassicasterol, campesterol, stigmasterol, beta-sitosterol and delta 7-stigmasterol in different vegetable oils. The results obtained with this method, in mg/g of oil, are in line with accepted levels. AS

- 2078 Cetin (YM). Behaviour of tocopherol and tocotrienol isomers in soybean and oat oil testing the oxidative stability with the automated Rancimat method. *Deutsche Lebensmittel-Rundschau* 85; 1989; 390-393 (De).

This research has been expressing the behaviours of tocopherol (Toc) and tocotrienol (Toc₃) isomers in the soybean and oat oil during the heating at 100 °C in the Rancimat Instrument by passing air through them. The studied soybean oil sample had been containing total 1026 mg/kg alpha, beta-, gamma, and delta-Toc. Although oat oil sample had been containing total 523 mg/kg alpha-, Toc, alpha-Toc₃, beta-Toc and beta-Toc₃. Division rate beta-Toc/alpha-Toc was same for both oils. The amount of beta-Toc in these oils is the lowest

compared to other isomers in them. When the oils were heated isomers decreased differently. In the case of soybean oil there is a similarity between the decreasing of alpha-Toc- and gamma-Toc, and between beta-Toc and delta Toc. In the case of oat oil there is a similarity between the decreasing of beta-Toc and beta-Toc₃ and probably between alpha-Toc and beta-Toc₃. In addition, in the case of soybean oil beta-Toc decreased more slowly than alpha- and gamma-Toc. During the heating in a long period of time beta-Toc of oat oil is decreased and diminished first. During same period of time Beta-Toc, level decreased about one-third of its original level, alpha-Toc₃ and gamma, level almost did not changed. Despite the total of Toc-isomers in the soybean oil is twice of oat oil, the induction time of soybean oil which is 9 h, is less than the induction time of oat oil. Soybean oil has been reached to its induction time just after the last Toc isomer disappeared. During 51 h heating the oat oil has not been reached to its induction time. AS

Cottonseed oils

- 2079 Hron (RJ), Kuk (MS) and Abraham (G). Determination of free and total gossypol by high performance liquid chromatography. *Journal of the American Oil Chemist's Society* 67(3); 1990; 182-187

Existing HPLC methods determine only pure gossypol whereas the official AOCS method determines both gossypol and other physiologically active gossypol-like compounds that react with 3-amino-1-propanol and aniline. The feed industry uses the official AOCS method, which is complex and produces results that do not correlate well among lab. HPLC methods were developed, using 3-amino-1-propanol as a complexing agent, for the quantitative detn. of free and total gossypol in cottonseed meal, oil, and ethanolic miscella. These methods are simple, sensitive, and provide reproducible results, In addition the use of toxic aniline is eliminated. AS

Palm oils

- 2080 Busfield (WK) and Proschogo (PN). Thermal analysis of palm stearine by DSC. *Journal of the American Oil Chemist's Society* 67(3); 1990; 171-175

The chem. comp. and thermal properties of palm stearine have been investigated. MNK

- 2081 Ken Busfield (W) and Proschogo (PN). Hydrogenation of palm stearine. Changes in chemical composition and thermal properties. *Journal of the American Oil Chemist's Society* 67(3); 1990; 176-181

The progress of hydrogenation of palm stearine using a trans promoting catalyst has been followed by monitoring the chem. comp. and the thermal properties by NMR and DSC techniques. The results show that hydrogenation occurs in 2 stages. In the first stage, the formation of the triglyceride, PEP from the lower melting PLP, allows an enhanced mixed crystal formation with the high melting PPP. Although this promotes a greater rate of crystallization in the alpha- form and transformation to the beta- form in tempering, further transformation to the beta- is inhibited. Ttmt is thereby reduced in the early stages even though both the rate of crystallization and the solid fat content at temp. < 40 C are increased. In the later stages of hydrogenation, the conversion of the triglyceride P00 to the higher melting POS increases the proportion of the sample which can crystallize in the high melting fraction to at least 80%. Although this still cannot be transformed into the beta- crystal form, Ttmt for the overall sample and the solids content at all temp. are now greater than those of the original palm stearine sample. AS

Rapeseed oils

- 2082 Kowalski (B). Thermoanalytical investigations of edible oils and fats. I. Kinetics of thermal-oxidative decomposition of rapeseed oil. *Acta Alimentaria Polonica* 14(2); 1988; 195-206

Experiments with rapeseed oil using the differential scanning calorimeter (DSC) have been carried out. For DSC traces obtained at different heating rates the peak max. temp. were selected and used for calculation of kinetic parameters and Arrhenius activation energy of thermal oxidative decomposition of oil. AS

- 2083 Prevot (A), Perrin (JL), Laclaverie (G), Auge (P) and Coustille (JL). A new variety of low-linolenic rapeseed oil. Characteristic and room-odour test. *Journal of the American Oil Chemist's Society* 67(3); 1990; 161-164

Two Canadian rapeseed oils, "Westar" and "low-linolenic" supplied by the Canola Council were studied and compared with a French rapeseed. The linolenic acid content of the low-linolenic var. is about 3%. This drop in the C18:3 is completely compensated for by an increase in the C18:2. Seventy-two per cent of the triglycerides with at least one linolenic chain disappeared. A strong increase in the OOL and OLL was observed. The room-odour tests showed that the "low linolenic" had a significantly higher odour score than the French rapeseed and the "Westar", both of these being very similar. A fruity odour dominated in the "low-linolenic", and the fishy painty odours were particularly reduced. AS

Soybean oils

- 2084 Kim (IH) and Yoon (SH). Effect of extraction solvents on oxidative stability of crude soybean oil. *Journal of the American Oil Chemist's Society* 67(3); 1990; 165-167

Crude soybean oil obtained by different extraction solvents namely hexane, water and chloroform methanol (2:1) were examined for oxidative stability using gas chromatographic head space analysis and peroxide value detn. Crude soybean oil extracted using chloroform methanol 2:1 was found to contain the most phosphoric and was most stable in oil oxidation. MNK

SPICES AND CONDIMENTS

Essential oils

Mint oils

- 2085 Singh (AK), Singh (K), Naqvi (AA) and Thakur (RS). Effect of storage of herb on the quality and yield of oil in mint species. *Research and Industry, India* 35(1); 1990; 46-48

Oil yield and oil quality of fresh and 1 to 20 days stored 4 mint sp., (*M. arvensis*, *M. citrata*, *M. spicata* and *M. piperita*) were assessed. Yield of oil increased in *M. arvensis*, *M. spicata* and *M. piperita* after one-day storage; beyond this a decrease was observed. In *M. citrata* storage decreased the oil yield and a marked decrease in linalool and increase in linalyl acetate content in the oil was observed. Quality of oil as affected by storage of herbs before distilling which was assessed by analysing for menthol, menthone and iso-menthone for all the 4 sp., every day of storage up to a max. of 20 days and the results are tabulated. KAR

Spices

- 2086 Paleari (MA), Concini (G) and Beretta (G). Spiced salami and possible inhibitory effect of spices. *Industrie Alimentari* 28(275); 1989; 953-951, 961 (It).

Chillies

- 2087 Quinones-Seglie (CR), Burns (EE) and Villalon (B). Capsaicinoids and pungency in various capsicums. *Lebensmittel-Wissenschaft und -Technologie* 22(4); 1989; 196-198

Capsaicin and dihydrocapsaicin in jalapeno, chile and serrano types of *Capsicum annuum* peppers were investigated. Extracts were obtained by Soxhlet extraction of freeze-dried peppers in HPLC grade acetone at 65-75 °C for 5 h. Capsaicins in cvs of each type were separated by high-pressure liquid chromatography and assayed by ultraviolet absorption at 280 nm. The major capsaicinoids in all types were identified as capsaicin and dihydrocapsaicin. These were compared to pungencies determined by the Scoville Heat Test and the Gillette Test. The correlation with Scoville Heat Units was 0.98 and with the Gillette method 0.97 which lends confidence to the more rapid Gillette Test. AS

Mustards

- 2088 Mnzava (N (A) and Olsson (K). Studies on tropical vegetables. Part I. Seed amino, fatty acid and glucosinolate profile of Ethiopian mustards (*Brassica carinata* Braun.). *Food Chemistry* 35(3); 1990; 229-235

Amino acid analysis in seed of local Ethiopian mustard (*Brassica carinata* Braun) show high levels of (in g/100 g protein) glutamic acid (20.7), arginine (10.8) and proline (6.5) while histidine (2.9) and tyrosine (2.5) were lowest. Variation between selections existed. 'Mulio giant' has consistently high values while 'CRRS-5' and 'Figiri white' were lower. Mean amino acid

- 2089 Shahidi (F) and Gabon (J-E). Fate of sinigrin in methanol/ammonia/water-hexane extraction of *B. juncea* mustard seed. *Journal of Food Science* 55(3); 1990; 793-795

The individual glucosinolates present in *B. juncea* mustard seed were determined. Sinigrin (allyl glucosinolate) was the major glucosinolate of mustard seed and constituted 92.9% of the total glucosinolates. The effect of methanol/ammonia/water-hexane treatment on the concn. of glucosinolates was studied. Over 97% of sinigrin originally present in the seed was removed by the above solvent extraction system, mainly in the intact form. Breakdown products of sinigrin were quantified in the treated meal, in the extracted oil and in the polar phase (gums). Aglycon products were allyl cyanide, allyl isothiocyanate and 2,3-epithiopropene cyanide. Sugar breakdown products were glucose, thioglucose, thioglucose dimer and furfuryl alcohol. Desulfosinigrin was a minor decomposition product and might have acted as an intermediate in the decomposition of sinigrin. AS

SENSORY EVALUATION

Nil

FOOD STORAGE

- 2090 Bhavani (JK) and Anbarasu (K). Standardization of storage, handling, marketing and transportation of food grains. *ISI Bulletin* 3(11); 1990; 433-437, 441

Losses of food grains occur during harvesting, transportation, storage and marketing of food grains as the operations have not been standardized under Indian condition. This paper attempts to review such aspects as standardisation of food grain storage structures including underground structures, usefulness of masonry structures for bulk storage, and storage bins. Storage management and fumigation practices also need standardization. Other aspects which need standardization are bulk handling equipment including bulk elevators, and chains and belt conveyor systems, agricultural marketing system and farm transport equipment. The attempt made by the Bureau of Indian Standards in formulating standards and specifications for some of the items have also been mentioned. KAR

- 2091 Tomasicchio (M), Andreotti (R), Pirazzoli (P) and Pezzani (G). Application of the Weibull statistical model to the shelf-life of some frozen foods. *Industria Conserve* 64(2); 1989; 102-109 (It).

The results of sensory evaluations carried out in tests on the shelf-life of various frozen foods were processed by means of the Weibull statistical model, which allows the probability of sensory failure (PSF) to be determined. This parameter expresses the percentage failure by time for a given product. AS

INFESTATION CONTROL AND PESTICIDES

Insects

- 2092 Kaaya (GP). Assessment of antibiotic potentials of insect antibacterial factors. *Insect Science and Its Application* 10(3); 1989; 341-346

Immune haemolymphs from the giant silkworm, *Hyalophora cecropia* and, to a lesser extent, from the tsetse, *Glossina morsitans morsitans* possess antibacterial activities against several sp. of bacteria known to be pathogenic to man, animals and poultry, as demonstrated by in vitro bacterial growth inhibition assays. *Cecropia* immune haemolymph possesses a broader antibacterial spectrum and was found to be active against several Gram-positive and Gram-negative pathogenic bacteria. Mice injected with pre-determined lethal doses of *Enterobacter cloacae*, *Klebsiella pneumoniae* and *Corynebacterium pseudotuberculosis* and then treated with single intraperitoneal or subcutaneous injections of *Cecropia* immune haemolymph had much lower mortality than untreated controls. A possibility of developing a broad-spectrum antibiotic modelled on insect immune factors is discussed. AS

- 2093 Waladde (SM), Hassanali (A) and Ochieng (SA). Taste sensilla responses to limonoids, natural insect antifeedants. *Insect Science and Its Application* 10(3); 1989; 301-308

Limonoids such as deoxylimonin, obacunone and pedonin are known to have antifeedant effects against some lepidopteran pests. However, there is no electrophysiological data showing the effect of these compounds have on taste receptor cells. This information gap is due to the fact that limonoids are insoluble in water and this makes it difficult to apply the tip-recording technique in an electrophysiological bioassay of limonoids. This problem was solved by dissolving the limonoids in a mixture of 50% tetrahydrofuran and 50% aqueous NaCl. Limonoids and sucrose so dissolved were used to investigate responses of *Eldana saccharina* maxillary styloconic sensilla. The solvent mixture did not appear to damage the taste receptor cells and the taste receptor responses to solutes dissolved in that solvent were reproducible. Sucrose stimulated a cell in the medial as well as in the lateral styloconic sensilla. Deoxylimonin alone stimulated a cell in the medial sensillum but not in the lateral sensillum. When presented with sucrose, deoxylimonin inhibited the sugar receptor cell and this was also true for obacunone. AS

Pesticides

- 2094 Leitner (H), Schildknecht (H), Achtnich (W), Schulleni (F) and Wolf (W). Pesticides of *Crotalaria ochroleuca* seed. *Chemie Mikrobiologie Technologie der Lebensmittel* 12(5); 1990; 151-158 (De).

The effect of extracts of *Crotalaria ochroleuca* seeds on the mortality of *Sitophilus oryzae* was examined. An increase of the mortality on destructive insects which contaminate stored cereals has already been observed in Tanzania some yr

ago under field conditions. As it was obvious from preliminary studies, that volatiles might be responsible for the toxic effect of the seeds, these substances were isolated by simultaneous steam distillation/extraction. The insects, exposed to these extracts, gave similar responses to grounded *Crotalaria ochroleuca* seeds. In further exp. the extracts were fractionated twice by preparative GC to limit the activity and the fractions were tested on *Sitophilus oryzae*. Two substances were identified as active compounds against *S. oryzae* by means of GC/MS: 2-methoxy-3, 5-dimethylpyrazine and 2-methoxy-3-isopropylpyrazine. AS

- 2095 Omura (M), Hashimoto (K), Ohta (K), Iio (T), Ueda (S), Ando (K), Hiraide (H) and Kinase (N). Relative retention time diagram as a useful tool for gas chromatographic analysis and electron-capture detection of pesticides. *Journal of the Association of Official Analytical Chemists* 73(2); 1990; 300-306

Biofungicides

- 2096 Pusey (PL). Use of *Bacillus subtilis* and related organisms as biofungicides. *Pesticide Science* 27(2); 1989; 133-140

Use of strain of *Bacillus subtilis* (designated B-3) as a biological control agent is reviewed, with emphasis on the post-harvest application to stone fruit for control of brown rot caused by *Monilinia fructicola*. Included are studies on the antifungal peptides (identified as Iturin antibiotics) produced by B-3 lab. tests to determine compatibility of the organism with current commercial procedures, and a pilot test on simulated and commercial peachpacking lines. In the pilot test B-3 (2×10^8 to 7×10^8 CFU kg^{-1} fruit) in commercial wax was equal to benomyl (1-2 mg kg^{-1} fruit) in controlling brown rot. The bacterium was screened for use against other fungal pathogens of stored plant products. In vitro activity against fungi was shown for apple rots caused by *M. fructicola*, *Botrytis cinerea*, and *Glomerella cingulata*, and for grey mould of grapes caused by *B. cinerea*. AS

BIOCHEMISTRY AND NUTRITION

- 2097 Ajayi (DA). Bioavailability of riboflavin from fortified palm juice *Qualitas Plantarum - Plants Foods for Human Nutrition* 39(4); 1989; 375-380

This study attempts to evaluate the riboflavin status and haematological response of young adults consuming riboflavin fortified palm juice. Riboflavin status was assessed from urinary riboflavin excretion and erythrocyte glutathione

reductase activity coeff. (EGR-AC) while iron status was assessed from haemoglobin and serum ferritin concn. The consumption of unfortified palm juice made significant contribution to the meager riboflavin intake, but it conferred no metabolic advantage. The consumption of fortified palm juice produced a marked reduction in EGR-AC values and a significant increase in urinary riboflavin excretion. Since Fe release from storage sites may be flavin dependent, riboflavin deficiency may affect Fe utilisation. Fortification may prove effective in alleviating nutrient deficiencies, but the carrier vehicle must be acceptable to all age groups. AS

- 2098 Brouwer (ID), Nederveen (LM), den Hertog (AP) and Vlasveld (AHC). Nutritional impacts of an increasing fuelwood shortage in rural households in developing countries. *Progress in Food and Nutrition Science* 13(3/4); 1989; 349-361

Developing countries face the problem of an increasing fuelwood shortage. For rural households, fuelwood is the main source of energy. As energy is essential to make food suitable for human consumption by means of cooking, the present fuelwood crisis could jeopardize the nutritional situation of rural households. This article reviews and analyses available data and information on the relationship between the availability of fuelwood and the nutritional situation of rural households. Based on analysis of empirical studies, three main strategies evolved by rural households, especially by the women within these households, to cope with a shortage of fuelwood can be distinguished; (i) increasing in time and energy spent on fuelwood collection, (ii) substitution of fuelwood by alternative fuels and (iii) economizing on the consumption of fuelwood and alternative fuels. These coping-strategies affect food supply, food preservation, all of which result in a decrease in quality and quantity of food consumed and in a deterioration of physical conditions, especially women and their young children. Available data on fuelwood availability and nutrition are rather diffuse and incomplete. The presence of several confounding variables in the studies analysed make it difficult to establish the nutritional impact of a growing shortage of fuelwood. Nevertheless, it is concluded that a shortage of fuelwoods plays at least an important role in changes in nutritional situation of rural households. If current trends continue, this role will become more important and evident. The impact of a growing fuelwood shortage should be a point of concern for rural development. AS

- 2099 Chobert (J-M), Sitohy (MZ) and Whitaker (JR). Covalent attachment of phosphate and amino acids to zein. Functional and nutritional properties. *Sciences Des Aliments* 9(4); 1989; 749-761

Zein was phosphorylated by phosphorus oxychloride at pH 5-8 and 0-20 °C. Up to 40 mol of phosphate/mol of protein were covalently attached to zein. When the free amino acids tryptophan and/or lysine were added to zein in the presence of phosphorus oxychloride, some amino acids were covalently bound to zein, in addition to covalent attachment of phosphate groups. Threonine did not become incorporated into zein by this method. Phosphorylation of zein in absence or presence of amino acids markedly increased the water solubility of zein above and below pH 4, the min. solubility point. All the modified zeins had improved emulsifying activity. A derivative containing 0.98 mol P/mol of zein, along with 1.05% tryptophan and 0.24% lysine, had a relative growth effect on *Tetrahymena thermophila* of 49% that of casein, in comparison to 4.5% for unmodified zein. AS

- 2100 Collin (JC) and Law (BA). Isolation and characterization of the L-methionine-gamma-demethiolase from *Brevibacterium linens* NCD0 739. *Sciences Des Aliments* 9(4); 1989; 805-812

The best conditions to produce the L-methionine-gamma-demethiolase (EC 4.4.1.11) from *Brevibacterium linens* (NCD0 739) isolated from Camembert cheese, have been studied to determine the characteristics of this enzyme. The optimum specific methanethiol production capacity was obtained with 2% (w/v) bacteriological peptone, 1% (w/v) NaCl, 1% (w/v) potassium hydrophosphate 2% (w/v) casein and 0.3% (w/v) beef extract in the culture medium. The enzyme precipitated between 20 and 40% ammonium sulphate and was stabilized with 1.4 M glycerol and 100 mM pyridoxal 5-phosphoric acid. The optimum pH for enzymatic activity was 8.0 and the optimum stability was obtained between pH 5.5 and 7.5. The mol. wt. was 175 plus or minus 6 KDa., and the isoelectric point between pH 5.0 and 6.0. The electrophoretic mobility in an acrylamide bisacrylamide agarose gel (5%, 0.5%, 0.8%) in Tris/glycine buffer pH 8.6 was $29.5 \text{ MUCM}^{-2} \text{ V}^{-1} \text{ S}^{-1}$. AS

- 2101 DeMucciarelli (S), De Arrellano (M), Cid (JA), Fernandez (S), Petenatti (E), De Luquez (N), Scognamillo (G) and Muzaber (JE). Leaf protein from *Atriplex crenatifolia*. Proximate chemical composition and biological value. *Sciences Des Aliments* 9(4); 1989; 741-747

The aim of this work was to carry on research on the quality of the protein from leaves of the *Atriplex* genus which includes indigenous and naturalized sp. *Atriplex crenatifolia*, and indigenous sp. came from the Ecological Reserve of Nacunan (Argentine Republic). The proximate chem. analysis of the raw material (water, protein, ether extract, raw fiber, ashes, sugars, starch, P, Ca, Na, K and silica), was carried out. The best conditions for the extraction and precipitation of

proteins were studied and established, and were the following: extraction after maceration in sodium sulphite taken to pH 9.5 with sodium hydroxide solution 5 N, solvent/sample ratio 1:3 g/ml; extraction time: 2 h with mechanical stirring, precipitation at pH 4.5 at 85 °C. A light brown product, with a protein content of 45/100 g dry wt. was obtained. The analysis of amino acids from the protein conc. (PC) indicated a very well balanced protein, with a chem. score of 77 calculated using FAO/WHO reference pattern (sulphur amino acids as first limiting amino acids). N retention was evaluated by means of biological tests; the following values were obtained; Net protein utilization (NPU): 59 plus or minus 2.0 true digestibility (TD): 73 plus or minus 2.0, and biological Value (BV): 81. AS

- 2102 Hauck (M). Enzymatic hydrolysis of proteins for sample preparation and determination of amino acids. *Deutsche Lebensmittel-Rundschau* 86(1); 1990; 12-15 (De).

Enzymatic hydrolysis of proteins, here casein, as a sample preparation procedure for the analysis of amino acids is described and compared with data of acid hydrolysis. The enzymatic hydrolysis is realized by incubation of the protein with proteinases and afterwards with amino peptidase. One proteinase is used as an immobilized enzyme bounded on a polymer carrier. The main advantage of the enzymatic hydrolysis is the quantitative recovery of amino acids which are unstable in acid or alkali (e.g. asparagine, glutamine, tryptophan, serine). The enzymatic hydrolysis is also a method of sample preparation for the analysis of Maillard products which are unstable under current hydrolysis conditions. A decrease of free and native lysine was found in casein-lactose-mixture. AS

- 2103 Kim (KS) and Rhee (JS). Effect of acetylation on emulsifying properties of glycinin. *Journal of Agricultural and Food Chemistry* 38(3); 1990; 669-674

Emulsifying properties of acetylated glycinin were checked on samples of 0%, 45% and 90% lysine residue modification. Sonication at 15 W was employed for making emulsion. At an oil to protein solution vol. ratio of 2.5:7 (v/v), pH 7.6, 90% acetylated glycinin showed an over 70% increase in emulsifying activity over native protein. Above the isoelectric point (pI) of the protein, emulsifying activity of acetylated protein was superior to that of native glycinin. Below the pI, native glycinin showed better emulsifying activity. Emulsion stability of the glycinin was significantly improved by acetylation. Changes in emulsifying properties of acetylated glycinin are discussed in terms of such intrinsic properties of the protein as surface hydrophobicity and flexibility. Effects

of the presence of NaCl, CaCl, and beta-mercaptoethanol and browning as the result of incubation with glucose are also discussed. AS

- 2104 Klein (T) and Knorr (D). Oxygen absorption properties of powdered iron. *Journal of Food Science* 55(3); 1990; 869-870

Powdered iron with a particle size $< 10 \mu\text{m}$ was used as the basic oxygen scavenging system in air-filled glass containers. The scavenger was tested unpackaged or sealed in polyethylene pouches. Scavenger concn. and packaging system affected rates of oxygen removal. Relative humidity markedly influenced the effectiveness of the oxygen scavenger system. At 98% RH, oxygen concn. in air-filled containers reached 1.6% after 21 h, while one-half of the oxygen remained at 65% RH. Overall, the data suggest = 1 to 1.5% oxygen removed per hour at 22 plus or minus 2 C depending on the RH values of the systems. AS

- 2105 Kratzer (FH), Bersch (S) and Vohra (P). Evaluation of heat-damage to protein by Coomassie, Blue G dye-binding. *Journal of Food Science* 55(3); 1990; 805-807

A rapid, simple method is described which may be useful for detn. of heat-damage to proteins in processed foods. It uses the Coomassie Blue dye-binding (DB) capacity of food proteins extractable in 0.2% KOH, with lysozyme as reference standard. The presence of glucose or lactose was essential to reduce DB capacity of casein on autoclaving. The DB capacity, on dried basis, of fat-free milk, whole egg, egg white, or blood was reduced rapidly with autoclaving, but not that of gelatin and gluten. The DB capacity of extracted soybean flakes, mung beans and black eyed pea beans was reduced gradually as the time of autoclaving was increased. AS

- 2106 Labuza (TP) and Massaro (SA). Browning and amino acid loss in model total parenteral nutrition solutions. *Journal of Food Science* 55(3); 1990; 821-826

The kinetics of browning and amino acid loss due to the Maillard reaction was studied in model total parenteral nutrition (TPN) systems containing glucose and either lysine, tryptophan, and cysteine alone or in combination. Cysteine systems showed the highest molar rate of browning while lysine showed the slowest rate. The molar rate of browning with all amino acids combined was significantly less than that of the sum of the individual rates, indicating interactions or inhibition. TPN electrolytes had no significant effect on the browning rate. The amino acids showed an initial rapid pseudo-first-order decrease in concn. followed by an apparent recovery and stabilization at an equilibrium concn. of about 60-80% of the original level. AS

- 2107 Molnar-perl (I), Pinter-Szakacs (M) and Medzihradsky (D). Dye-binding stoichiometry and selectivity of cresol red with various proteins. *Food Chemistry* 35(1); 1990; 69-80

Dye-binding stoichiometry and selectivity of the reactions of several standard proteins and protein matrices with the phthalein dye cresol red (CR) are presented. Spectrophotometric measurements show that the interactions are selective; amino acids, peptides, and albumin-type proteins do not react at all. The optimum analytical conditions of the reactive proteins-human gamma-globulin (HGG), casein (C), milk protein (MP), soybean (SBM), meat (MM), and fish meals (FM)-with CR are given. Dye-binding values obtained with soybean meals are complemented by the sodium dodecyl sulphate-polyacrylamide gel electrophoretic patterns of the same samples, in order to show a qualitative picture of the mol. wt. distribution of three untreated samples when comparing them to their respective denatured ones. AS

- 2108 Mongeau (R) and Brassard (R). Determination of insoluble, soluble, and total dietary fiber. *Cereal Foods World* 35(3); 1990; 319-324 (Co).

A collaborative study was conducted on a rapid gravimetric method to determine total dietary fiber content of selected food products. Blind duplicate test samples from five products and two pre-trial test samples were analyzed by 10 collaborators. In the soluble fiber analysis test portions were autoclaved, treated with a heat stable amylase, amyloglucosidase, and protease to remove protein and starch. Soluble fiber was precipitated using four vol. of anhydrous ethanol. In the insoluble fiber analysis, test portions were refluxed with neutral detergent, and the residue was treated with pancreatic alphasamylase to remove residual starch. In both procedures, the residue was dried at 105 C, wt., ashed at 525 C and reweighted. Total dietary fiber was calculated as the net residue (ash subtracted) of the soluble and insoluble fractions. The RSD_{vr} and RSD_{vr} values of the data from 8-10 lab. ranged from 1.5% to 12.2%, except for the rice product in which the RSD_{tRt} was 12.9%; the latter product contained only 1.2% fiber and its S_{vRv} was 0.22%. AS

- 2109 Nova Derivi (SC), Marques Mendez (MH), Rezende Rodrigues (MC) and Fernandes (ML). The dietary fiber fraction in raw and processed foods. *Archivos Latinoamericanos de Nutricion* 38(4); 1988; 965-978 (Es).

The purpose of the present study was to estimate dietary fiber components in raw vegetables processed by different methods. Samples of 8 raw, 15 boiled, 5 fermented, 5 fried and

2 canned vegetables were analyzed. Results indicated the sample vegetables after being boiled, canned, fermented and fried, presented alterations in the dietary fiber insoluble and soluble components, i.e; by interaction or solubility tending to an increase or decrease of its components. Results obtained in the dietary fiber components of processed vegetables, in the sample analyzed, presented variations among them with the different processing techniques. AS

- 2110 Srivastav (PP), Das (H) and Sitaram Prasad. Effect of roasting process variables in in vitro protein digestibility of Bengalgram, maize and soybean. *Food Chemistry* 35(1); 1990; 31-37

The effect of roasting process variables (temp. and time of roasting) on in vitro protein digestibility of roasted and ground Bengalgram, maize and soybean were studied. Roasting resulted in a slight increase in the PD value. Statistical analysis using an analysis of variance technique showed that the effect of time of roasting on the PD value of Bengalgram and maize was more than that of temp. of roasting. An opposite trend was observed in the case of soybean. AS

TOXICOLOGY

- 2111 Borzelleca (JF), Olson (JW) and Reno (FE). Lifetime toxicity/carcinogenicity study of FD & C Red No. 40 (Allura Red) in Sprague-Dawley rats. *Food and Chemical Toxicology* 27(11); 1989; 701-705

This paper describes the effects of life time dietary exposure of rats to FD & C Red No. 40 following exposure in utero in study conducted between 1974 to 1977. The FD & C Red No 40 was administered to parental rats (30 of each sex per groups) at concn. of 0.0, 0.37, 1.39 and 5.19% throughout the mating, gestation and lactation periods with the control group receiving the basal diet. After random selection of first generation rats, the life time phase was initiated using the same dietary concn. with 50 rats of each sex per group. The results showed that the max. durations of exposure to the colouring were 118 and 121 wks for males and females resp. No adverse effects were observed except for a reduction in body wt. in high dose females at the end of the studies. The safe levels were found to be 5.19% (28 29 mg/kg day) for male rats and 1.39% (901 mg/kg /day) for female rats. KAR

- 2112 Collins (TFX), Black (TN), Welsh (JJ) and Brown (LH). Study of the teratogenic potential of FD & C red No. 40 when given by gavage to rats. *Food and Chemical Toxicology* 27(11); 1989; 707-

This study was conducted to clarify the effects of a bolus dose of the colouring on developing foetuses as it is consumed daily in food by humans and the possible effects of a large bolus dose are not known. For this purpose Osborne-Mendel rats were intubated with FD & C Red No 40 at levels of 0, 30, 75, 150, 300, 600 or 1000 mg/kg body wt./day on days 0-19 of gestation. Results showed that no developmental toxicity was observed when the rats were sacrificed on day 20 of gestation. Nodose relative changes were seen in maternal daily observations, food consumption body wt., gain or implantations or in foetal viability, body wt., body length, sex distribution or external variations. Skeletal and soft tissue development appeared similar in foetuses of all groups. The isolated increases that occurred in the number of male foetuses, number of females, with two or more resorptions, number of litters with three or more sternebral variations and incidence of 14th ribband are considered random occurrences and are not related to dosage. KAR

- 2113 Georgii (S), Brunn (H), Stojanowic (V) and Muskat (E). Xenobiotics in food stuffs-estimation of daily intake. III. Chlororganic pesticides in selected foodstuffs, invalid diets and baby foods. *Deutsche Lebensmittel-Rundschau* 85(12); 1989; 385-389 (De).

The residues of the organochlorine substance alpha-, beta- and gamma-HCH, HCB and P, P'-DDE were determined in foodstuffs of animal origin, margarine, beer, daily invalid diets and in baby foods. The investigation show a further decrease of the analysed foodstuffs with the persistent chlorinated hydrocarbons HCH, HCB and DDE. The tolerance levels were only reached up for 2-5%. The average daily intake which was estimated with help of model calculations for the chlorinated hydrocarbons in the investigated foodstuffs is: 1.05 MUg for gamma-HCH, 0.09 MUg for HCB and 2.28 MUg for DDE. For a more realistic estimation of the daily intake, were determined invalid diets (49 samples) and 41 samples of baby food. For the invalid diets, the results show an average daily intake of 1.15 MUg for gamma-HCH and 1.16 MUg for DDE. Thus the acceptable daily intakes (ADI) for gamma-HCH and the sum of DDT, DDE, and DDD set by the FAO/WHO were only reached up to 0.16% and 0.33%. Alpha- and beta-hexachlorocyclohexane and hexachlorobenzene have no share at the average daily intake. Likewise very low was the pollution of baby food with HCH. HCB and DDE so the average daily intake was 0.05 MUg for gamma-HCH and 0.08 MUg for DDE per day and person. Also in this case the acceptable daily intake (ADI) for gamma-HCH and the sum of DDT, DDE and DDD were well below the limits established by the FAO/WHO. AS

- 2114 Stelz (A), Georgii (S), Brunn (H) and Muskat (E). Xenobiotics in food stuffs-estimation of a daily food intake. IV. Heavy metals. *Deutsche Lebensmittel-Rundschau* 86(1); 1990; 10-12

From 43 daily inpatient rations taken from three hospital kitchens the contents of As, Pb, Cd and Hg were determined by way of atomic absorption spectrometry following dissolution of the samples by nitric acid. In six samples only, As concn. above the method detection limit of 0.04 mg/kg could be detected and in one sample only a Hg concn. above 0.025 mg/kg could be determined. The highest As and Hg concn. were found in a ration, which included a fish meal. The mean Pb content of the daily rations was 65 g/kg and the mean Cd content was 12 g/kg of fresh substance. Data on the average weekly intake of As and Hg per person cannot be provided on the basis of the investigation results since in the predominant portion of the samples the content were below the detection limit. For Pb an average weekly intake of 544 g per person and for Cd an average weekly intake of 100 g per person were calculated on the basis of the investigation results. The tolerable weekly intake of 3000 g of the Pb and of 400-500 µg of Cd per person as recommended by the WHO were not reached by far. AS

Mycotoxins

Aflatoxins

- 2115 Lapa (MAG), Zucas (SM), Bion (FM), Barros (SRA), Lago (ES) and Varela (RM). Influence of aflatoxin B1 on growth of rats subjected to different nutritional conditions. *Archivos Latinoamericanos de Nutricion* 38(2); 1988; 323-329 (Es).

The effect of the addition of aflatoxin B1 was studied in 48 male, Sprague-Dawley rats weaned at 21 days of age. The animals of the experimental group received one of the following diets to which aflatoxin B1 was added (5 mg/kg ration), a protein-free diet, the regional basic diet of Northeast Brazil (RBD) containing 9.07% protein, and commercial casein diets (at 10 and 20%). The control groups were fed the same diets without aflatoxin B1. To detect possible body alterations, the body wt. and food intake, as well as protein and aflatoxin B1 intakes were recorded. Significant alterations were detected in the experimental groups, especially in the protein-depleted animals, and in those fed the RBD and 10% commercial casein diets, when compared to their controls. AS

- 2116 Wiewiorowska (M), Golinski (P) and Szebiotko (K). Utilization by low energy processing of plant origin materials contaminated with mycotoxins. *Acta Alimentaria Polonica* 14(2); 1988; 157-163

During cereals silage process 80-90% decomposition of zearalenone and ochratoxin A was observed. During lactic fermentation decomposition of ochratoxin A was in range 9-99% and was depended on activity of bacteria. The highest activity exhibited inoculum of lactic acid bacteria stored up to one wk at + 4 C. AS

GENERAL

- 2117 Palmer (D). The gentle touch. *Food* 11(12); 1989; 52-53

This article describes briefly about particulate fillers capable of dispensing delicate particulate products.
SYR

FOOD PROCESSING

- 2118 Gill (TA), Thompson (JW), LeBlanc (G) and Lawrence (R). Computerized control strategies for a steam retort. *Journal of Food Engineering* 10(2); 1989; 135-154

The present study considered the application of on-line computer data acquisition and control to the thermal processing of foods in hermetically sealed containers. A pilot-scale steam retort was fitted with a control system based on a desk-top computer. Under computer control, the retort could be operated conventionally as a series of timed sequential process steps or the process time could be based on a target lethality defined by the operator. In the later case, feed-forward prediction of the cooling period lethality was used. One control program was based upon thermocouple data derived from test cans. The lethalties determined in real time were compared with those derived numerically by simulating heat penetration by the method of finite differences. The two control programs (thermal couple-in can and numerical) were compared for their ability to respond to process deviations. The statistical aspects of computerized retort control were also determined. AS

- 2119 Lee (JH) and Singh (RK). Sensitivity analysis of aseptic process simulations for foods containing particulates. *Journal of Food Process Engineering* 12(4); 1990; 295-321

A sensitivity analysis of a computer model simulating heat transfer into particulate foods processed in a continuous aseptic system was conducted to determine how the model reacts to the variations in selected product and process input parameters depending on simulation types, namely, total, F Hold and Hold only. Three major output variables, namely, holding tube required to destroy 6 D of *Clostridium sporogenes* (PA 3679), destruction of thiamine and inactivation of peroxide were selected for the sensitivity analysis. Theoretical results indicated that basically no difference between the "Total" system approach

and the "F Hold" approach was found on the model prediction. Particle size, particle thermal properties such as density and specific heat were the most sensitive parameters (within the range investigated) among product parameters which influence holding tube length required, thiamine and peroxidase retention while fluid properties such as fluid thermal conductivity and viscosity were less susceptible to affect the model prediction regardless of simulation types. Among process parameters, product flow rate and product initial temp. seemed to be the most critical parameters within the range covered in this study while rotor speed seemed to be one of the least critical parameters to influence the model prediction regardless of simulation types. AS

- 212 Payne (FA), Taraba (JL) and Saputra (D). A review of puffing processes for expansion of biological products. *Journal of Food Engineering* 10(3); 1989; 183-197

A research objective to develop a puffing process which would improve the rehydration characteristics of air-dried fruits and vegetables led to a review of puffing processes described in the US patent and published literature. The puffing processes found were classified into four categories based on the method responsible for gas evolution: phase change, absorption, adsorption, and chem. reaction. An explosive expansion rate E was calculated for different puffing processes in each category. It appears that E must be in the range 0.05-12 m³/s kg to puff biological products. AS

- 2121 Sadeghi (F) and Swartzel (KR). Generating kinetic data for use in design and evaluation of high temperature food processing systems. *Journal of Food Science* 55(3); 1990; 851-853

The kinetics of sucrose (pH 2.5), Blue # 2 (pH 11.3) and Blue # 2 (pH 9.5) were determined for high food processing temp. A traditional batch kinetic data generation and a novel continuous flow method were examined. The novel method consisted of a tubular flow reactor designed to establish the time-temp. equivalent points for any process. Activation energy value determined for the continuous method were 46.0, 27.2, and 52.3 kJ/mol for sucrose, Blue # 2 (pH 11.3) and Blue # 2 (pH 9.5), resp. Values utilizing the traditional batch (capillary tube) generation method yielded 94.6, 58.2 and 74.5 kJ/mol, resp. Based on these results, a new thermal evaluation technique is proposed for describing difficult to define continuous flow systems. AS

FOOD PACKAGING

- 2122 Christine Lake. Time capsule. *Food* 11(11); 1989; 53-55

Various methods of encapsulation of sensitive and volatile materials such as vitamins, spices, seasonings etc. are described. Suitable coating materials in common use are also mentioned. SYR

Packaging materials

- 2123 Mahadevaiah (M). Metal containers for packing processed food products. Present status and future prospects in India. *Indian Food Industry* 9(1); 1990; 33-38

The author discusses the present status of metal containers industry in India, the installed capacity of Indian tin plate manufacturers, the estimated demand for tin plate, besides the indiginisation of tin plate, tin-free steel and Al have been highlighted. GP

FOOD ENGINEERING AND EQUIPMENT

Engineering

- 2124 Anon. Microwaveability. *Food* 11(10); 1989; 23

The key problems in becoming better acquainted and therefore using the full potential of microwave ovens are described. SYR

- 2125 Miyawaki (O), Sato (Y), Yano (T), Ito (K) and Saeki (Y). Fundamental aspects of viscosity monitoring by the hot wire technique. *Journal of Food Science* 55(3); 1990; 854-857

Fundamental aspects of the monitoring of viscosity by the hot wire technique in stagnant test fluid was investigated. The behaviour of the hot wire viscosity sensor was well described, theoretically, by the stagnant layer analysis combined with the Ostrach solution for natural convection heat-transfer from a vertical plate. To improve the sensitivity of the sensor to the change in viscosity of a test fluid, lower curvature for the sensory structure and higher heat flux for the operating condition were recommended theoretically and proved experimentally. As a practical example, the change in apparent viscosity during the coagulation of soy protein was monitored using

the hot wire sensor. AS

- 2126 Pham (QT). Effect of supercooling on freezing time due to dendritic growth of ice crystals. *International Journal of Refrigeration* 12(5); 1989; 295-300

A finite-difference procedure was used to calculate the freezing time of a slab when supercooling occurs. Crystallization is assumed to take place at a definite nucleation temp., followed by dendritic growth of crystals. Resistance to mass transfer is neglected. The effects of various parameters were examined. It was shown that the effect of supercooling of freezing time may be significant at combinations of low Biot number, low nucleation temp. and high freezing-medium temp. in situations where ice forms as dendrites. AS

Equipments

- 2127 Ollett (A-L), Li (Y), Parker (R) and Smith (AC). A comparative study of the conveying performance of screws in a twin-screw co-rotating extrusion-cooker. *Journal of Food Engineering* 10(3); 1989; 165-181

A study of extruder performance has been made using both self-wiping and closely intermeshing screws for the extrusion-cooking of wheat starch in a twin-screw co-rotating extruder. The axial pressure profile, die pressure, screw torque and residence time distribution were measured over a range of screw speeds (75-300 rev min⁻¹) for each screw geometry. The residence time distributions for the closely intermeshing and self-wiping screws were similar. The mean residence time decreased from about 80 s at 75 rev min⁻¹ to 40-50 s at 300 rev min⁻¹. The axial pressure profile and dead-stopped runs showed that there were different distributions of fill within the extruder barrel for the two screw geometries. Whereas the mean time in the solids-conveying section was shorter for the self-wiping screws the time in the fully filled section was correspondingly longer. The results demonstrated that the closely intermeshing screws had a greater melt pumping action than the self-wiping screws. AS

- 2128 Stafford (JV), Weaving (GS) and Lowe (JC). A portable infra-red moisture meter for agricultural and food materials. Part 1. Instrument development. *Journal of Agricultural Engineering Research* 43(1); 1989; 45-56

An instrument based on the near infra-red reflectance technique has been developed for on-farm rapid measurement of moisture content in grass and forage crops with potential

application to other agricultural or food materials. The design of a portable, battery-operated self-contained robust instrument suitable for farm use has been made possible by the use of two light emitting diodes (LED) that emit radiation in the near infra-red spectrum as sources. The use of a complementary metal oxide silicon (CMOS) single chip microcomputer to control operation of the instrument incorporating a read-out of moisture content. The paper describes development of the instrument. AS

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

- 2129 Cliffor (MN) and Ramirez-Martinez (JR). Chlorogenic acids and purine alkaloids contents of mate (*Ilex paraguariensis*) leaf and beverages. *Food Chemistry* 35(1); 1990; 13-21

Five samples of mate leaf have been analysed for chlorogenic acid, caffeine and theobromine, and found to comprise two distinct categories of product. Category 1 produced brown extracts and infusions with relatively small contents of alkaloids and total chlorogenic acids whereas Category 2 produced green extracts and infusions with larger total alkaloids contents and much larger total chlorogenic acids contents. The green mate samples contained a quercetin glycoside, and were a convenient source from which to isolate 3-caffeoylquinic acid and 3,5-dicaffeoylquinic acid. Neither condensed nor hydrolysable tannins were detected. AS

- 2130 Jindra (J). Acid mix. *Food* 11(12); 1989; 43-44

The properties, functions and applications of food acids such as citric, malic and fumaric are discussed in brief. SYR

- 2131 Khandelwal (GD) and Wedzicha (BL). Derivatives of sorbic acid-thiol adducts. *Food Chemistry* 37(3); 1990; 159-169

Ethyl and methyl sorbate react with thiols in the corresponding alcohol as solvent and with sodium alkoxide as catalyst. Nucleophilic attack by alkylthiols leads to the

formation of diadducts (2,3- and 4,5-addition of $H^+ RS^{-1}$) whilst reaction with mercaptoethanol, esters of 2-mercaptoacetic acid, and cysteine ethyl ester gives the 2,5-addition product. Detailed consideration is given to the location of the double bond in position 3. Attempted hydrolysis of the esters causes dissociation of monoadducts liberating sorbic acid. However, if sorbic acid is allowed to react with cysteine in a predominantly aqueous medium, and the product esterified, it is identical to that formed from the esters of sorbic acid and of cysteine. AS

- 2132 Schuchmann (H), Roy (I) and Peleg (M). Empirical models for moisture sorption isotherms at very high water activities. *Journal of Food Science* 55(3); 1990; 759-762

Published moisture sorption data of selected gums, fibers and starch determined at water activities of up to 0.98-0.99 were fitted by an empirical three parameter model. It had the general mathematical structure of the GAB model but its abscissa's range was expanded from 0 to 1, to 0 to infinity. This was done by substituting, in $[1/(1 - \text{water activity})]$ or $\text{water activity}/(1 - \text{water activity})$ for water activity, terms that could be derived from Henderson's and Oswin's models. This hybrid model with either substitution had a particularly good fit to the isotherms part that accounted for moisture sorption at high water activities. The model with the logarithmic transformation, however, appeared to be more practical and to better account for the intermediate part of the moisture sorption isotherm. AS

- 2133 Tzeng (WC) and Zall (RR). Polymers decrease cleaning time on an ultrafiltration membrane fouled with pectin. *Journal of Food Science* 55(3); 1990; 873-874

An ultrafiltration systems fouled by pectin solutions was used as a model system. The fouled membrane flux was fully restored by circulating 0.5% NaOH solution for 1 h. By adding 0.003% poly(ethylene oxide) in 0.5% NaOH solution, the cleaning time required to fully recover flux of the fouled membrane was reduced to 2 min. The mechanism of improving cleaning efficiency may not be wholly attributed to the scouring effect of the polymer on the membrane surface. The cleaning and rinsing results suggest that polymers in cleaning solutions convert the pectin foulant into a foulant-polymer complex which could be readily rinsed from the membrane surface by water. AS

Chemistry(Analytical)

- 2134 Hamid (JA), Moody (GJ) and Thomas (JDR). Flow-through multi-enzyme electrodes for the determination of lactose. *Analyst*

(London) 114(12); 1989; 1587-1591

Four types of lactose-sensing electrodes based on uni-, di-, tri- and tetra- enzyme system have been studied. The enzymes lactase, glucose oxidase, mutarotase and galactose oxidase were immobilised on nylon net which covered the platinum electrode. Lactose was determined amperometrically by monitoring the hydrogen peroxide enzymolysis product at +600 mv versus a silver-silver chloride reference electrode. N

- 2135 Lau (O-W), Luk (SF) and Huang (H-L). Spectrometric determination of tannins in tea and beer samples with iron (III) and 1, 10-phenanthroline as reagents. *Analyst (London)* 114(5); 1989; 631-633

A simple and accurate spectrophotometric method is proposed for the detn. of tannins in tea and beer samples based on the reduction of iron (III) to iron (II) by tannins at 80 C for 20 min. The iron (II) was then reacted with 1, 10-phenanthroline at pH 4.4 to form a coloured complex. Background correction could be effected by precipitating the tannins in the sample solution twice with gelatin and kaolin. Absorbance measurements were made at 540 nm and the calibration graph was linear from 0 to 5.5 $\mu\text{g ml}^{-1}$ of tannin acid with a slope of 0.213 A p.p.m.⁻¹. The precision for the detn. of tannins in a tea sample containing 9.45% of tannins was 1.8%. Most of the ingredients commonly found in tea and beer samples do not interfere with the detn. Several tea and beer samples were analysed for their tannin content using the proposed method. AS

- 2136 Oyaizu (M). Antioxidative activities of browning products of glucosamine fractionated by organic solvent and thin-layer chromatography. *Journal of the Japanese Society of Starch Science* 35(11); 1988; 771-775 (Ja).

Glucosamine in free-form was browned in powder, in aqueous solution and as anhydride. Brownish products were fractionated with methanol and ethanol and their properties were determined. The products were also fractionated by thin-layer chromatography (TLC). Type G product which was heated 1 h at 90 C showed the highest antioxidative activity. Among the methanol and ethanol fractions, in soluble ones showed the highest antioxidative activity. The activity of each fraction fractionated with TLC was lower than those of unfractionated. AS

FOOD MICROBIOLOGY AND HYGIENE

2137 Stone (C). Kitted out. *Food* 11(11); 1989; 33-37

Newer microbiological methods of testing food products are described. SYR

Fermentation

2138 Sanchez Vasquez (JE). A practical attempt at improving cocoa fermentation by direct inoculation with microorganisms. *Cafe-Cocoa-The* 33(3); 1989; 157-164 (Fr).

Two treatments were applied to beans in wooden boxes with a view to improving the quality of commercial cocoa by controlling fermentation. Each box contained 1200 kg of fresh beans. The first batch was inoculated with *Candida famata* C-30 at the beginning of fermentation and with *Acetobacter* sp. B-46 twenty-four h later. Both these strains come from natural cocoa fermentation. The second batch was inoculated with *Brettanomyces clausenii* C-Y-31-2-2 at the beginning of fermentation. An uninoculated check batch was also fermented in the traditional way. During fermentation, the changes in temp., the pH of the pulp, volatile acid content, internal colour of the beans (cut-test) and microbe populations were observed. Chocolate was prepared from the cocoa obtained. Treatment 1 and the check behaved in similar ways. The second treatment reached its max. fermentation temp. twenty-four h later and the change in the volatile acid content was different. Bean quality was slightly better for treatment 2. For the two treatments the chocolate produced was different from the chocolate made from the check: the chocolate from treatment 1 was more acid, more astringent and less pleasant than the chocolate made from the check; the causes of the difference between the chocolate from treatment 2 and the chocolate from the check could not be detected but both were equally pleasant. AS

2139 Villeneuve (F), Cros (E), Vincent (J-C) and Machexic (J-J). Search for a fermentation index of cocoa. III. Changes in the flavan-3-ols in the bean. *Cafe-Cocoa-The* 33(3); 1989; 165-170 (Fr).

(-)-epicatechin and procyanidins B-2, B-5 and C-1 have been identified in the cocoa bean (*Amazonian hybrids*). The changes in the flavanols during an 8 days fermentation have been monitored by HPLC and a key stage between the 2nd and 4th day has been characterized. The substantial decrease (90%) in the contents of these compounds as well as the

content procyanidin/epicatechin ratio are probably due to a complex set of reactions. AS

Fermented foods

Warri

- 2140 Soni (SK) and Sandhu (DK). Biochemical and nutritional changes associated with Indian Punjabi Warri fermentation. *Journal of Food Science and Technology (India)* 27(2); 1989; 82-85

Traditional Punjabi Warri fermentation involving different substrates has been evaluated for biochemical and nutritional changes. A significant increase in the bacterial and yeast cell counts along with total acids, dough vol., soluble solids, non-protein nitrogen; soluble nitrogen, free amino acids, proteinases and water soluble vitamins including B1, B2, B12 was observed during the fermentation of conventional black gram warri doughs thus accounting for increased digestibility and nutritional value. Total nitrogen and total proteins however did not show any significant change whereas pH, reducing sugars and soluble protein contents decreased appreciably following 5 days of simultaneous fermentation and drying in open. New Warri doughs involving mung beans in place of black gram revealed the comparable changes as observed in the conventional type, but the soluble constituents and amylase contents were higher in the former. AS

Bacteria

Lactococcus lactis

- 2141 Booth (M), Jennings (IV), Phaolain (IN) and O'Cuinn (G). Prolidase activity of *Lactococcus lactis* sub spp. *Cremoris* AM2. Partial purification and characterisation. *Journal of Dairy Research* 57(2); 1990; 245-254

Prolidase activity from cytoplasm of *Lactococcus lactis* subsp. *Cremoris* (*Streptococcus cremoris*) AM2 was partially purified. The enzyme had M_r 42000 and optimum activity between pH 7.35 and 8.25 in citrate, phosphate and borate buffers while in a universal buffer system an optimum pH between 8.3 and 9.0 was observed. The activity was strongly inhibited by the chelating agents EDTA, 1, 10-phenanthroline and 8-hydroxyquinoline. Inhibition was also noted with dithiothreitol, N-ethylmaleimide and bacitracin. The enzyme was active on all amino acylproline substrates tested except Gly-Pro and Glp-Pro and also showed activity against Pro-Pro. While most prolyl amino acids tested were not

hydrolysed, hydrolysis was noted with Pro-Ala and Pro-Val. K_m values of 20mM and 10mM were obtained with Phe-Pro and Met-Pro resp., however, substrate inhibition was observed with Ile-Pro and Leu-Pro. AS

Lactococcus lactis

- 2142 Spelhaug (SR) and Harlander (SK). Inhibition of foodborne bacterial pathogens by bacteriocins from *Lactococcus lactis* and *Pediococcus pentosaceus*. *Journal of Food Protection* 52(12); 1989; 856-862

The objective of this study was to develop an appropriate method for detecting specific bacteriocin-mediated inhibition. This method could be used to determine the effectiveness of known bacteriocin-producing lactic acid bacteria against foodborne pathogens. *Lactococcus lactis* subsp. *lactis* 11454, *Pediococcus pentosaceus* FBB61, and *P. pentosaceus* FBB63-DG2 were evaluated for their ability to inhibit a var. of foodborne pathogens. On the three procedures used, the agar spot method was chosen as the most reproducible and reliable assay method. After optimization of the plate agar media comp., and the time and temp. of the assay, the three bacteriocin-producing strains were screened against a broad range of Gram-positive and Gram-negative foodborne pathogens. The three bacteriocin-producing organisms inhibited the following Gram-positive foodborne pathogens: *Bacillus cereus*, *Clostridium perfringens*, *Staphylococcus aureus*, and 22 representatives of 5 sp. of *Listeria* including *L. monocytogenes*, *L. ivanovii*, *L. innocua*, *L. seeligeri*, and *L. welshimeri*. Additionally, strain 11454 slightly inhibited several Gram-negative foodborne pathogens, including *Aeromonas hydrophila* AH2, *Escherichia coli* O157:H7, *Vibrio cholerae* 851, and *V. parahaemolyticus* A865957. Gram-negative organisms not inhibited by any of the bacteriocin-producing organisms included *Campylobacter jejuni*, several serovars of *Salmonella enteritidis*, and sp. of *Yersinia* and *Vibrio*. AS

Listeria monocytogenes

- 2143 Buchanan (RL), Stahl (HG) and Whiting (RC). Effects and interactions of temperature, pH, atmosphere, sodium chloride, and sodium nitrite on the growth of *Listeria monocytogenes*. *Journal of Food Protection* 52(12); 1989; 844-851

The effects and interactions of temp. (5, 19, 28, 37 C), initial pH (6.0 and 7.5), atm. (aerobic and anaerobic), NaCl content (0.5 and 4.5%), and sodium nitrite concn. (0, 50, 100, 200, 1000 ug/ml) on the growth of *Listeria*

monocytogenes Scott A were determined using Tryptose Phosphate Broth. Growth data were analyzed by regression analysis to generate "best-fit" Gompertz equations, which were used subsequently to calculate lag phase duration, exponential growth rate, generation time, and max. population density values. The data indicated that the growth kinetics of **L. monocytogenes** was dependent on the interaction of the five variable, particularly in regard to exponential growth rates and lag phase durations. The data suggest that sodium nitrite can have significant bacteriostatic activity against **L. monocytogenes** and may provide cured meats with a degree of protection against this microorganisms, particularly if employed in conjunction with a combination of acidic pH, vacuum packaging, high salt concn., and adequate refrigeration. AS

Staphylococcus

- 2144 Dickie (N) and Akhtar (M). Concentration of Staphylococcal enterotoxin from food extract using copper chelate sepharose. *Journal of Food Protection* 52(12); 1989; 903-905

A simple and rapid method is described for detecting as little as 1 ng each of staphylococcal enterotoxins A, B, and C₂ in 100 mL samples of food extracts. Samples were fractionated on Cu chelate Sepharose 6B and the recovery of added staphylococcal enterotoxin was measured by the reversed passive latex agglutination test. An approximate 100 fold concn. of toxin was obtained. The method should prove useful as a partial purification and concn. step in the analysis of foods incriminated in food poisoning outbreaks. AS

Staphylococcus aureus

- 2145 Tuncan (EU) and Martin (SE). Combined effects of salts and temperature on the thermal destruction of **Staphylococcus aureus** MF-31. *Journal of Food Science* 55(3); 1990; 833-836

The combined effects of salts (NaCl and KCl) and heat treatment temp. on the thermal destruction of **Staphylococcus aureus** MF-31 was studied by determining the relationships between the decimal reduction time (D value), temp. and each of three parameters (water activity, osmotic pressure and water binding energy) of the heating menstruum. The results demonstrated that the resistance of **S. aureus** MF-31 to heat destruction increased as the degree of salt-water association increased. Salts and heat treatment temp. had an interactive effect on heat resistance however, increasing the heat treatment temp. made the differences caused by salt concn. become insignificant. AS

Fungi

Fusarium sambucinum

- 2146 Richardson (KE), Toney (GE), Haney (CA) and Hamilton (PB). Occurrence of scirpentriol and its seven acetylated derivatives in culture extracts of *Fusarium sambucinum* NRRL 13495. *Journal of Food Protection* 52(12); 1989; 871-876

Ethyl acetate extracts of culture filtrates from *Fusarium sambucinum* NRRL 13495 contained scirpentriol, triacetoxyscirpenol, 4, 15-diacetoxyscirpenol, 3,4-diacetoxyscirpenol, 3-15-diacetoxyscirpenol, 15-monoacetoxyscirpenol, 4-monoacetoxyscirpenol, and 3-monoacetoxyscirpenol which are the eight possible members of the scirpentriol family of trichothecene mycotoxins. These eight mycotoxins were identified by chem. derivatization, thin layer chromatography, gas chromatography, mass spectroscopy, nuclear magnetic resonance, and comparison to standards. The total concn. of scirpenol derivatives in the culture filtrate was 426 mg/liter of which 346 mg/L was 4,15-diacetoxyscirpenol. The occurrence of a complete family of mycotoxins in a single culture implies that outbreaks of toxicity associated with *Fusarium* may be multiple toxicoses, and that the screening of foodstuffs for trichothecenes should be broadened, particularly potato tubers which are subject to infection by end, particularly potato tubers which are subject to infection by *F. sambucinum*. AS

Mushrooms

- 2147 Vetter (J). Comparison of mineral elements in *Agaricus* and *Pleurotus* fruit bodies. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(4); 1989; 346-350 (De).

Twenty-three mineral elements were investigated for their presence in some *Agaricus* and *Pleurotus* sp. and their cultivated sorts. The *Agaricus* sp. have remarkable accumulations of arsenic that are seldom reported in the literature (except for *A. bisporus*); this phenomenon could not be demonstrated in the *Pleurotus* sp. A remarkable accumulation of Cd was found in the *Agaricus* sp. (except for *A. bisporus* and *A. xanthoderma*). Accumulation of Cu was measured in the *Agaricus* fruit bodies (25-260 mg/kg), while the average Cu level in the *Pleurotus* sp. was 12.6 mg/kg. Only the *Agaricus* sp. can be characterized by an increased K and P content and this is advantageous from the point of view of nutritional physiology. AS

Yeasts

Saccharomyces cerevisiae

- 2148 Cerrutti (P), Alzamora (SM) and Chirife (J). A multi-parameter approach to control the growth of *Saccharomyces cerevisiae* in laboratory media. *Journal of Food Science* 55(3); 1990; 837-840

The effects of combinations of reduced water activity (water activity from 0.97 to 0.93), pH (3, 4, 5, and 6) and addition of potassium sorbate (0, 100, 500, and 1,000 p.p.m.) on the growth of one strain of *Saccharomyces cerevisiae* in lab. medium were studied. The minimal water activity for growth inhibition in the absence of sorbate and in the range of optimal pH was 0.89. Various combinations of water activity, pH and sorbate concn. prevented growth of the yeast at water activity values above 0.89. For example, at water activity = 0.93, addition of 100 p.p.m. sorbate at pH = 4.0 resulted in inhibition; at water activity = 0.97 and same pH (4.0), 500 p.p.m. of sorbate were necessary. The combined effects of the above parameters on generation time, max. population, and lag time of the cells were also determined. AS

Talaromyces flavus

- 2149 Douglas King (AJr) and Whitehand (LC). Alteration of *Talaromyces flavus* heat resistance by growth conditions and heating medium composition. *Journal of Food Science* 55(3); 1990; 830-832, 836

BIOTECHNOLOGY

Nil

TISSUE CULTURE

Nil

FOOD ADDITIVES

Antioxidants

- 2150 Christine Lake.. Vitamins health or hazard? *Food* 11(11); 1989; 24-25

The importance of antioxidant vitamins like vitamin C and E and beta-carotene in the prevention of cancer, cardiovascular disease and cataracts is described briefly. SYR

TBHQ

- 2151 Kim (CM) and Pratt (DE). Degradation products of 2-tert-butylhydroquinone at frying temperature. *Journal of Food Science* 55(3); 1990; 847-850, 853

Decomposed products of 2-tert-butylhydroquinone (TBHQ) at frying temp. in model system were identified and characterized. An attempt was made to determine the functions of the decomposed compounds in foods using model system. Tert-butylbenzoquinone (TBBQ) was identified as the primary and major oxidation products of TBHQ. Interconversion between TBHQ and TBBQ was the most important role in antioxidant effectiveness and carry-through effect of TBHQ. Several types of dimers by ether linkage resulting from thermolysis at frying temp. were identified. In addition, significant reactivity of a phenolic antioxidant with the functional carboxyl group of a fatty acid, which might lower antioxidant effectiveness, was determined using a simple model systems. AS

Emulsifiers

- 2152 Burgaud (I) and Dickinson (E). Emulsifying effects of food macromolecules in presence of ethanol. *Journal of Food Science* 55(3); 1990; 875-878

The influence of droplet size of ethanol present during homogenization was investigated for emulsions stabilized by macromolecular emulsifiers, sodium caseinate, whey protein isolate, gelatin and gum arabic. Emulsions produced with polysaccharide gum arabic had increasing droplet size as ethanol concn. increased, in contrast to the protein-stabilized emulsions which had decreasing droplet size (up to 20% ethanol for gelatin and 30% ethanol for the milk proteins), followed by increasing droplet size with increasing ethanol concn. Interfacial tension measurements indicated that the emulsifying property of the macromolecules depended on adsorption at the oil water/alcohol interface during emulsification. AS

Gelling agents

- 2153 Vic Morris. New ways of structuring food. *Food* 11(12); 1989; 47-51

The uses of polysaccharides and some proteins as gelling agents in design of food products are described. The recent bacterial polysaccharide, glucan and its application are described. The proteins discussed are cheap waste globular protein isolates. The mixing of biopolymers to produce new use and properties is also briefly discussed. SYR

Sweeteners

- 2154 Hendley (S). A generation later. Part I. *Food* 11(12); 1989; 37, 39, 41

The classification, function and applications of various sweeteners are described briefly. The diabetic and non-cariogenic sugars are also described. SYR

CEREALS

- 2155 Miki (E), Yoshida (M) and Yamano (Y). Change in density of dough during Japanese noodle making. *Journal of the Japanese Society of Starch Science* 35(11); 1988; 735-741 (Ja).

Inclusion of air into dough during mixing and deaeration from dough during rest or sheeting were investigated by measuring the density of dough. The density of dough decreased with an increase of mixing time when using a mixer. The smaller the water content or the larger the amount of NaCl, the less the decreasing rate of dough density. Neither addition of NEM1 nor cysteine did not change the dough density. While, by hand mixing, the density was almost constant through mixing. The density increased during rest period and the increase was remarkable especially within 2 h of rest. The increase of density in the rest period was great for the dough which showed a larger decrease of density during mixing. From these results, it was considered that inclusion of air into dough cause the decrease of dough density by mixing and deaeration from dough cause the increase of dough density by rest. While, sheeting of dough did not show a variation of density, so it suggested that sheeting did not cause deaeration. The relaxation modulus of the cooked noodle prepared from the dough which has been rested for 4 h was 1.4 fold as large as that of the sample prepared from the unrested dough. Reason for this increase of relaxation modulus is considered to be due to compacting of dough structure by deaeration from dough. AS

- 2156 Salgo (A), Torok (S) and Sandor (S). Microstructure of

extruded mixtures of cereals and oilseed processing residues. *Food Microstructure* 8(2); 1989; 245-252

The utilization of valuable by-products of seed processing residues as co-extrusion materials was investigated. By mixing sunflower, pumpkin, corn or rice germ presscake with cereals (wheat, corn and rice), the good protein quality of the former group might improve the biological value of the resulting co-extrudates. The microstructure of such co-extruded products was analysed with reference to their chem. comp., nutritional characteristics and functional properties. As seed processing residue was increased, the microstructure of the products became more compact considerably. The results showed that the highest acceptable concn. of the additive was not more than 20-40% for the applied high temp. short-time procedure. AS

Barley

- 2157 Cowe (IA), Cuthbertson (DC) and Swanston (JS). The effects of moisture and nitrogen levels on milling energy of barley. *Journal of the Institute of Brewing* 95(6); 1989; 423-425

Milling energy values of both spring and winter cvs of barley are shown to be highly influenced by moisture content of samples. Within the range 10 to 18% moisture, the relationship between milling energy and moisture content was linear. For spring barley, milling energy values could be adjusted to a common moisture content of 12% using a correction factor of 25 Joules for each per cent moisture. Nitrogen content of malting samples correlated poorly, although still at a significant level, with milling energy and considerable variation in grain hardness could be observed at any N level considered suitable for malting. AS

- 2158 Harland (GA) and Madson (MA). Barley dormancy and fatty acid composition of lipids isolated from freshly harvested and stored kernels. *Journal of the Institute of Brewing* 95(6); 1989; 437-442

The influence of kernel surface lipids on barley dormancy was investigated. Kernels with surface lipids extracted by chloroform:methanol (2:1) germinated nearly as well as intact kernels subsequent to steeping in either distilled water or a solution of formaldehyde (ca 800 mg/l). Both water-sensitivity and innate dormancy were reduced in intact and surface-lipid extracted kernels steeped in formaldehyde when compared with kernels steeped in distilled water. Differences in fatty acid comp. occurred in both surface and total kernel lipids of grain held in storage.

However, compositional changes in fatty acids could not be used to predict kernel dormancy since increasing germination properties of kernels during the storage period were influenced by environmental conditions at time of harvest and varietal differences. AS

- 2159 Rotter (RG), Marquardt (RR) and Frohlich (AA). Ensiling as a means of reducing ochratoxin A concentrations in contaminated barley. *Journal of the Science of Food and Agriculture* 50(2); 1990; 155-166

The feasibility of ensiling barley contaminated with ochratoxin A (OA) as a practical method of inactivating OA was examined in *in vitro* and *in vivo* studies. In the *in vitro* study, OA concn. in barley decreased by approx. 68% after being ensiled for 56 days. To verify the destruction of the OA, a chick feeding trial was constructed. Samples of a toxin- and mould-free barley, mould contaminated barley, a barley sample naturally contaminated with OA or a barley with added OA were each divided into two equal portions, one of which was ensiled for a period of 28 days. The mould contaminated barley was naturally contaminated with *Penicillium cyclopium* and *Aspergillus flavus*. Diets containing either the ensiled or non-ensiled barley samples were then fed to 7-day-old Leghorn chicks for two 7 day periods. Changes in feed consumption (RFC) and body wt. gain (RWG) relative to control birds, feed to gain ratio and mortality were monitored. The OA concn. in the two OA-containing barley samples decreased by 58% after 28 days of ensiling, but there was no improvement ($P > 0.05$) in chick performance or mortality compared with the non-ensiled diets. The av. RFC values for chicks fed the mould and OA containing diets were $< 50\%$ of the controls and RWG generally $< 30\%$. In absolute terms, chicks fed the ensiled barley diets also performed about 6% poorer ($P < 0.003$) than those given the non-ensiled barley. Ensiling did not appear to be a practical method of reducing the toxic effect(s) of OA, despite the apparent decrease in OA concn. Grain samples should be tested for the presence of a toxin prior to ensiling to avoid possible toxin analysis problems later. AS

- 2160 Schapira (SFD), Whitehead (MP) and Flannigan (B). Effects of the mycotoxins diacetoxyscirpenol and deoxynivalenol on malting characteristics of barley. *Journal of the Institute of Brewing* 95(6); 1989; 415-417

In germination tests, the trichothene diacetoxyscirpenol (DAS) caused reductions in the number and total length of rootlets, and the length of the coleoptile, developing from excised barley embryos, but the effects were

less than those of T-2 toxin. Rootlet and coleoptile growth was also inhibited during micromalting of barley artificially contaminated with DAS before steeping, whilst-alpha-amylase activity of finished malts were reduced by up to 49%, and alpha-amino nitrogen levels in worts were also lower than in controls. The effects of deoxynivalenol (DON) were less than those of DAS, eg. the reduction in alpha-amylase activity caused by DON applied at the rate of 50 ug g⁻¹ grain was less than one-half of that caused by 20 ug DAS g⁻¹

AS

Oats

- 2161 Victor Wu (Y). Recovery of protein-rich by-products from oat stillage after alcohol distillation. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 588-592

Ground oats, ground groats, and oat flour were fermented to ethanol. After ethanol was distilled, residual stillage was separated by screening and centrifugation into distillers grains, centrifuged solids, and stillage solubles. Oat distillers grains and centrifuged solids had crude protein contents (N x 5.83, dry basis) of 19 and 44%, resp. and contained 67 and 5% of the total N of oats. Oat flour distillers grains and centrifuged solids had 43 and 48% protein, resp., and accounted for 13 and 58% of the total N of oat flour. Of the N in oat stillage solubles, 54% passed through a 10K mol. wt. cut-off membrane. Permeate from oat stillage solubles processed by combined ultrafiltration and reverse osmosis had much lower N, solids, and ash contents than did stillage solubles. This practical method to ferment ground oats and oat flour for ethanol and to recover valuable protein-rich by-products may have commercial potential. AS

Rice

- 2162 Avhurhi (JB) and Owens (JD). The influence of oxygen accessibility on the growth of yeast in fish/rice fermentation. *Journal of Food Science and Technology (India)* 27(2); 1990; 104-106

Fish/Rice mixture (1:3.6) was prepared and fermented between 12 and 21 days using 1 and 5% inoculum levels under 3 methods of air exclusion viz. layering with paraffin oil (PO), paraffin wax (PW) and fermentation lock alone (control). Yeast growths were recorded under all experimental conditions. No growth was recorded by the 12th day in the control. There was no significant difference in yeast counts between PO, PW and control. Yeasty flavour developed in bottles exposed to air while the characteristic

acid aroma was exhibited by other systems. AS

- 2163 Dhaliwal (YS), Sekhon (KS) and Nagi (HPS). Effect of drying and storage on the fatty acid composition of rice. *Journal of Food Science and Technology (India)* 27(2); 1990; 107-108

The effect of drying and storage of 3 var. of paddy ('IR-8', 'PR-108' and 'Basmati-370') on fatty acid comp. was investigated. Drying of paddy before storage did not produce a notable effect on the fatty acid comp. except that palmitic acid increased and linoleic acid decreased to some extent. Lower fatty acids, like palmitic, palmitoleic, stearic and linolenic acids increased with increase in storage period. Oleic and linoleic acids consistently decreased with increase in storage period. AS

- 2164 Watanabe (M), Miyakawa (J), Ikezawa (Z), Suzuki (Y), Hirao (T), Yoshizawa (T) and Arai (S). Production of hypoallergenic rice by enzymatic decomposition of constituent proteins. *Journal of Food Science* 55(3); 1990; 781-783

A method is proposed to produce hypoallergenic rice usable for patients with rice allergy. Newly harvested rice grains were dipped in carbonate (pH 9) containing glycerin monooleate and actinase and then the mixture was exposed to a reduced pressure for degassing. The degassed mixture was incubated at 37 C for 24 h to hydrolyze proteins. The process produced rice grains from which the major allergenic globulin was decomposed. The product was evaluated by the radioallergosorbent test (RAST), with the result that its RAST value suggested negative allergenicity in most cases. The product was clinically administered to 7 patients with atopic dermatitis and no allergic reaction was observed in 6 of the 7. AS

- 2165 Whittick (L). Just wild about rice. *Food* 11(12); 1989; 32-33

The cooking properties and applications of wild rice are briefly described. SYR

Rice flour

- 2166 Tsuji (S). Research on changes in physical properties of pastes of glutinous and non-glutinous rice flours by additives. Measurements of physical properties of pastes of rice flours by using the multi-biting test. Part II. *Journal of the Japanese Society of Starch Science* 35(11); 1988; 742-747 (Ja).

Changes in apparent physical properties of pastes of

glutinous and non-glutinous rice flours caused by heating and additives were analysed by the parameters in the multi-biting test. Parameters of the apparent springiness characteristics of the pastes of both rice flours obtained by the multi-biting were greatly increased or decreased by the addition of sodium palmitate, phosphoric acid or NaCl when they were compared to the normal pastes of rice flours heated at 98 C. But these changes were greatly different between the pastes of glutinous and non-glutinous rice flours under other heating conditions especially at 80 C and lower. These apparent physical changes of the pastes of both rice flours due to the heating conditions and the additives could also be analysed by the ratio of the parameter of apparent viscosity characteristics vs the parameter of apparent springiness characteristics obtained by the multi-biting test. These changes in the apparent physical properties of the pastes of both rice flours would be correlated not only to the additives but also to the gelatinization characters of the starch pastes of both rice flours. AS

Wheat

- 2167 Evers (AD) and Withey (RP). Use of image analysis to predict milling extraction rates of wheats. **Food Microstructure** 8(2); 1989; 191-199

Image analysis of grain morphological characteristics was examined as a possible means of predicting extraction rates of a wide var. of wheat types. Two elevations of grain were examined and measured. For the top view whole grains were used, while for the lateral view grains were sagittally bisected in the plane of the crease. Extraction rate was assessed on lab. mills and expressed as flour yield. Milling extraction rate correlated with one shape factor with a coeff. of 0.78. Inclusion of a second factor in a stepwise regression increased the correlation coeff. to 0.925. No satisfactory predictor of extraction rate exists at present although some grain traders believe that high grain specific wt. indicates good milling quality. Specific wt. of the wheats involved in the present study were measured and a significant negative correlation with flour yield, was found. AS

- 2168 Sutherland (JW), Fricke (PW) and Hill (RJ). The entomological and thermodynamic performance of penumatic conveyor wheat disinfestor using heated air. **Journal of Agricultural Engineering Research** 44(2); 1989; 113-124

Trials with a pilot-scale grain pneumatic conveyor (capacity 1 t/h) have shown that wheat can be disinfested of

all stages of *Rhyzopertha dominica* (F). (Coleoptera:Bostrychidae), the most heat tolerant of Australian grain insects, by heating to 70 C for a few seconds only and at a grain temp. as low as 58 C if a heat soaking period of one min is allowed before cooling. It was also found that the grain temp. lethal to insects decreased as the initial moisture content(MC) of the wheat was increased. No damage to wheat quality based on germination was observed in the range 10.5-13.4% MC. (w.b.). A mathematical model of the process was developed which predicted grain outlet temp. to within 1 C, and grain velocity and air pressure drop to within 5% of observed values. AS

Wheat flour

- 2169 McCarthy (PK), Scanlon (BF), Lumley (ID) and Griffin (M). Detection and quantification of adulteration of Durum wheat flour by flour from common wheat using reverse phase HPLC. *Journal of the Science of Food and Agriculture* 50(2); 1990; 211-226

When common wheat (*Triticum aestivum* L) gliadins were separated by RP HPLC, a major double peak eluted at 47.20 and 47.94 min. This peak was consistently found to be absent in Durum wheat (*Triticum durum* Desf) gliadins separated under identical conditions. In Durum wheat gliadins a characteristic small peak eluted at 48.30 min followed at 50.47, 51.37, 52.80 min by larger peaks. The peak area ratio of the peaks eluting at 50.47 and 51.37 min was found to be 2.18 (plus or minus 0.14). This ratio was found to decrease proportionally on contamination of durum wheat flour with flour from some common wheat var. This ratio alone was not enough to detect and quantify adulteration by all var. of common wheat. An alternative method was found whereby the peak emerging between 47 and 49 min in the Durum wheat gliadin elution profile was expressed as a ratio of the total protein applied. This ratio was shown to increase when Durum wheat flour was adulterated with flour from common wheat thus enabling quantitative estimation of the level of adulteration. A third method of detecting adulteration of Durum wheat flour is also proposed in which the peak emerging between 47 and 49 min is collected and the protein separated by PAGE. The presence of more than one band of gamma/beta-gliadins is indicative of adulteration. AS

Wheat products

- 2170 Thakur (BR) and Arya (SS). Packaging requirement and stability of fried wheat snacks (Trisnacks). *Journal of Food*

Science and Technology (India) 27(2); 1990; 76-81

Effect of ingredient comp. and packaging on the storage stability of fried wheat snacks was studied. Frying medium and packaging material influenced the rate of peroxidation and changes in sensory scores of wheat snacks during storage. Sweet and salted snacks fried in vanaspati and packed in paper-aluminium foil-polyethylene laminate remained stable for one yr. Snacks fried in groundnut oil and palm oil remained stable for 120 to 240 days resp. in various packaging films. Relatively sweet snacks were more stable to peroxidation than salted snacks. Crispness, aroma and taste were the major determinants of overall acceptability of fried wheat snacks. Both sweet and salted snacks were most stable around 0.33 water activity. AS

Wheat proteins

- 2171 Eliasson (A-C) and Lundh (G). Rheological and interfacial behaviour of some wheat protein fractions. **Journal of Texture Studies** 20(4); 1989; 431-441

Gluten from the wheat var. Monopol was fractionated by successive extractions with dilute HCl (0.625-1.5 mM). The first two fractions, obtained at the highest pH values, contained a high proportion of low mol. wt. proteins, they spread quickly at the air/water interface and when added to a wheat flour dough they increased the phase angle of the dough. The three following fractions contained a high proportion of high mol. wt. proteins, they spread very slowly at the air/water interface and they caused the wheat flour dough to become stiffer (the storage modulus increased) and more elastic (the phase angle delta decreased). The last fractions obtained in amounts enough for investigation were in between the other fractions in the mol. wt. distribution and interfacial behaviour, and they hardly affected the rheological properties of the dough. AS

MILLETS

- 2172 Dwivedi (PK), Tyagi (RPS) and Bansode (PC). Studies on fungal and mycotoxin contamination of stored millets kodon (*Paspalum scrobiculatum*) and kutki (*Panicum miliare*). **Journal of Food Science and Technology (India)** 27(2); 1990; 111-112

Screening of kodon (*Paspalum scrobiculatum*) and kutki (*Panicum miliare*) stored in traditional storage structures revealed that these millets were infected with aflatoxin

producing fungi. Most of the stored millets contained more than detectable quantity of aflatoxin. Proper storage can avoid danger of mycotoxins. AS

- 2173 Spaeth (SC), Debouch (DG), Tohme (J) and Van Beem (J). Microstructure of nunas. Andean popping beans (*Phaseolus vulgaris* L.). *Food Microstructure* 8(2); 1989; 263-269

Nunas, popping beans (*Phaseolus vulgaris* L.) burst and expand when heated rapidly. Differences in seed microstructure between popping and conventional (non-popping) bean genotypes conceivably contribute to popping in nunas. However, the microstructural characteristics which contribute to the popping attribute and sites of expansion have not been identified. Seeds and excised cotyledons of unpopped and popped nunas were examined using scanning electron microscopy (SEM). Protoplasts of unpopped nunas were similar to protoplasts of conventional beans. Intercellular spaces of unpopped nunas were occluded by schizogenous cell walls. The occluded form of intercellular spaces differed distinctively from the open form in popped nunas and untreated conventional beans. The expansion of cotyledon mesophyll in popped nunas came primarily from expansion of cell walls and secondarily by expansion of the intercellular spaces. Cell wall thickness and dimensions of protoplasts were not changed during popping. Expansion of cell walls away from protoplasts created intercellular voids. SEM images indicated that starch granules (grains) in popped nunas were generally not altered by popping. Starch granules did not gelatinize or melt during popping as indicated by retention of birefringence. In contrast to popcorn (*Zea mays* L.). Starch granules did not contribute to expansion of popped nuna cotyledons. AS

Corn

- 2174 Artz (WE), Warren (C) and Villota (R). Twin-screw extrusion modification of a corn fiber and corn starch extruded blend. *Journal of Food Science* 55(3); 1990; 746-750, 754

Surface response modeling was used to characterize the effect of extrusion processing on the functional properties of corn fiber/corn starch formulations. Process parameters evaluated included screw speed (200-500 rpm), temp. (90-150 C) and pH (3-11). Generally, the water holding capacity (WHC) of starch increased with increasing extrusion temp. while the WHC of the fiber decreased with increasing extrusion temp. The foam stability decreased, while the residual moisture increased, with an increase in fiber concn. X ray diffraction profiles indicated that extrusion did not affect fiber crystallinity. No significant changes

in the ratio of soluble to insoluble fiber were found as a result of extrusion. AS

- 2175 Kandala (CVK), Nelson (SO) and Lawrence (KC). Non-destructive electrical measurement of moisture content in single kernels of corn. *Journal of Agricultural Engineering Research* 44(2); 1989; 125-132

From measurements of capacitance, dissipation factor and phase angle on a small parallel-plate capacitor holding single kernels of corn (maize), *Zea mays* L. a non-destructive method was developed for estimating the moisture content of the kernel. The measurements were made with an impedance analyser at 1.0 and 4.5 MHz on single kernels with moisture contents ranging between 9.5% and 26%, wet basis, and their air-oven moisture values were obtained by a standard oven drying method. An empirical equation was developed that predicted the moisture contents of single kernels from several different corn lots within plus or minus 1% of the air-oven values for 91% of the kernels in this moisture range. AS

- 2176 Tsuji (S). Analysis on pasting properties of corn and waxy corn starches. Measurements on physical properties of starch pastes by using the multi-biting test. Part I. *Journal of the Japanese Society of Starch Science* 35(11); 1988; 748-754 (Ja).

Pasting properties of corn and waxy corn starches in different heating conditions were analyzed by using the multi-biting test. Changes in the physical properties of corn and waxy corn starches in different heating conditions could be analyzed effectively by the parameters obtained from the multi-biting test. Pasting properties of corn and waxy corn starches were much different depending upon the heating conditions and the kind of these starches. Addition of NaCl restrained gelatinization and gelation of the starch pastes prepared from corn and waxy corn starches, while their viscoelasticities were much influenced by the heating conditions. Effects of the addition of sodium palmitate and phosphoric acid to the pastes of starches were also much different according to the heating conditions and the kind of these starches. It was estimated that the rheological changes caused by the addition of the additives to the pastes of both starches in different heating conditions would be complicated in connection not only with additives but also with the gelatinization and gelation characteristics of both starches. AS

- 2177 Zhang (Q) and Litchfield (JB). Fuzzy expert systems. A prototype for control of corn breakage during drying.

Journal of Food Process Engineering 12(4); 1990; 259-273

A prototype fuzzy expert system was developed to predict the breakage susceptibility of corn for certain drying conditions and to provide recommendations for dryer control. The control decisions were based on predicted levels of breakage, drying conditions, and the recommendations of corn drying experts. Drying temp., initial moisture content, equilibrium moisture content, and level of the wet product holding bin were used as the process information for providing recommendations for drying temp. and flow rate adjustment. Two example drying processes were tested. The results of the study showed that (1) the predicted corn breakage levels matched the experimental results and (2) the control recommendations by the systems were consistent with domain experts. AS

Corn proteins

- 2178 Myers-Betts (PA) and Baianu (IG). Determination of the protein activity of corn zeins in alkaline solutions from ¹H in nuclear spin relaxation data as a function of concentration and heat treatments. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 477-483

Pearl millets

- 2179 Khetarpaul (N) and Chauhan (BM). Effect of germination and fermentation on in vitro starch and protein digestibility of pearl millet. *Journal of Food Science* 55(3); 1990; 883-884

Germination of pearl millet grain for 24 h significantly improved its in vitro starch and protein digestibility. Fermentation of pearl millet sprouts by mixed culture combinations of yeasts and bacteria (*Saccharomyces diastaticus* and *Lactobacillus brevis*; *Saccharomyces diastaticus* and *Lactobacillus fermentum*; *Saccharomyces cerevisiae* and *Lactobacillus brevis*; and *Saccharomyces cerevisiae* and *Lactobacillus fermentum*) resulted in a significant increase in protein and starch digestibility. The pearl millet sprouts fermented with mixed culture containing *S. diastaticus* and *L. brevis* had the highest in vitro starch digestibility, while the sprouts fermented with the culture containing *S. cerevisiae* and *L. fermentum* had the highest in vitro protein digestibility. AS

- 2180 Pawar (VD), Khandagale (MV) and Quadri (NF). Assessment of protein quality of depigmented pearl millet. *Journal of Food Science and Technology (India)* 27(2); 1990; 109-110

The protein quality of pearl millet soaked in 0.2 N HCl for 15 h and scarified upto 8.10, 11.56 and 15.84% and soaked in 0.2 N HCl for 40, 25 and 20 min, resp., was assessed by using rats. The protein efficiency ratio was found significantly increased from 2.14 to 2.32 in 15 h soaked and to 2.44 in 15.84% scarified and 20 min soaked pearl millet. The true digestibility, biological value, net protein utilization and UP were also found significantly increased in both soaked and scarified and soaked pearl millet. Soaking followed by scarification showed max. improvement in protein quality. AS

Sorghum

- 2181 Gutierrez (RR) and Gomez (MH). Physicochemical evaluation of sorghum-extruded products. *Archivos Latinoamericanos de Nutricion* 38(1); 1988; 132-142 (Es).

Yellow corn grits (M), brown sorghum (S_M) white sorghum (S_B) and full fat soy flour (S) blends were extruded in an autogenous Brady Crop Cooker extruder at 195-200 C and 11% moisture content. Binary blends (70:30) made up of M:S, S_M :S and S_B :S; and ternary blends (30:40:30) made up of S_M :M:S and S_B :M:S were extruded. Under these conditions, extrudates contained about 19% protein and 6% fat, which are within the specification given for cereal/oilseed blends. Raw and extruded samples were analyzed for ES, WQI, WSI, MD and paste viscosity. All blends underwent modifications in the starch fraction at granular and molecular level. Brown sorghum extrudates presented higher degradation than those of white sorghum and corn:soy blends, although the last one gave similar responses to analytical techniques. Extrudates greatly increased their ES, SWI and MD values, suggesting that degradation products, like dextrans, were presented. Cooked paste low viscosities (50 C) and micrographs support these findings. Because of their functional characteristics, extrudates could be used in beverages. AS

- 2182 Youssef (AMM), Moharram (YG), Moustaffa (EK), Bolling (H), El-Baya (A) and Harmuth (AE). New extruded products from sorghum. *Food Chemistry* 37(3); 1990; 189-199

Sixteen recipes were suggested in this study to prepare new extruded products from sorghum grains and its flour. The physical, chem., nutritional and organoleptic properties of these new products were evaluated. The results indicate the importance of both sorghum grain and/or its flour alone, or after mixing with other cereal grains in preparing acceptable extruded products. AS

PULSES

- 2183 Jibaja (CL) and Bressani (R). Effects of processing by granular grain roasting of the chemical and functional characteristics of legume grains. *Archivos Latinoamericanos de Nutricion* 38(1); 1988; 162-172 (Es).

The present research compares the effect of cooking cowpea, canavalia and lupin by pressure cooking and by a granular bed roaster, on chem. and physical characteristics. The wet cooking process was carried out by pressure cooking at 121 C for 30 min at 15 psi, using a bean-to-water ratio of 3 to 1. The cooked samples were dried with heated air (60 C). The granular bed roasting was carried out at 200 and 250 C for contact times of 2 and 2.5 min., at a 5 to 1 sand:bean ratio. For this process, a granular bed roaster was designed and constructed. This process induced in the grain temp. which varied from 90-128 C, and thermic efficiencies which fluctuated between 38 and 60%. The wet and the dry processes did not effect protein and fat content, although available lysine values decreased slightly. The two processes did not affect water absorption and water solubility. The nitrogen solubility index, however, decreased as roasting temp. increased in the case of the granular bed roaster, and it also decreased in the wet-cooking procedure. Both processes affected colour of the cooked flours, with a slight orange colour, suggesting non-enzymatic browning due to the high temp. used. AS

- 2184 Jibaja (CL) and Bressani (R). Evaluation of the protein quality of legume flours obtained by roasting in fluid sand beds. *Archivos Latinoamericanos de Nutricion* 38(1); 1988; 152-161 (Es).

Roasted flours from cowpea, canavalia and washed lupin were prepared by a thermic treatment in fluid sand beds at 150, 200 and 250 C for 2.0 and 2.5 min. followed by dehulling and grinding. A flour produced by pressure cooking at 121 C for 30 min followed by drying was used as reference. The flours were evaluated through residual levels of antitryptic activity, tannin content, available lysine, NPR and protein digestibility. The roasting and the pressure cooking processes increased NPR values. Nevertheless, the NPR values of all legume flours were significantly lower than the NPR casein values. The roasting process carried out under the conditions indicated inactivated trypsin inhibitor activity significantly. A small decrease in tannin content was also observed, with small insignificant changes in available lysine. The protein digestibility of all products was high with lupin,

digestibility being equal to that observed for casein. The roasting process in a fluid granular bed allows the production of products of acceptable protein quality with low levels of antiphenological factors. AS

Cowpeas

- 2185 Akinyele (IO) and Abudu (IA). Acceptability and nutrient content of milk substitutes from four cultivars of cowpeas (*Vigna unguiculata*). *Journal of Food Science* 55(3); 1990; 701-702, 707

Milk was extracted from four cvs of cowpeas and analysed for their nutrient content. The protein content of the milk substitutes varied from 1.2-3.0 g, energy, 17.9-2.4 Kcal; total solids 4.2-10.7 g and sugars from 0.2-0.6 g per 100 mL. The protein digestibility was from 56.0-78.5% and trypsin inhibitor activity was 5.8-7.1 TIU/mL. The cvs had an effect on the yields, the total solids, the energy, protein, total sugars, trypsin inhibitors activity, and digestibility of the milk substitutes. AS

- 2186 Ramesh (GS) and Nirankar Nath). Blanching requirements for dehydration of green cowpea (*Vigna unguiculata* Walp) pods. *Journal of Food Science and Technology (India)* 27(2); 1990; 113-115

The presence of peroxidase was found to have no significant effect on sensory qualities of dehydrated pods. Water activity of the dehydrated pods (16 min blanch, 5.9% moisture) was 0.28. Green cowpea pods should be dehydrated to about 4.7% moisture which was found to be their critical moisture level and it should not be allowed to rise above 8.2% during storage in order to ensure retention of its qualities. AS

Cowpea products

- 2187 Hung (Y-C), McWatters (KH), Phillips (RD) and Chinnan (MS). Effects of pre-decortication drying treatment on the microstructure of cowpea products. *Journal of Food Science* 55(3); 1990; 774-776, 807

A pretreatment process developed to prepare cowpeas for mechanical decortication by dry abrasion involves wetting, equilibrating and drying. Drying temp. of 50, 70, 90, 110, and 130 °C affected the microstructure of cowpea seeds, meal and akara (fried cowpea paste). Severe heat treatment damaged the middle lamella of cotyledon cells, changed the birefringence property of starch granules, reduced the amount of air incorporated in whipped paste and produced

akara with a non-uniform, dense structure. AS

Kidney beans

- 2188 Alli (I), Kermasha (S) and Mehran (M). Fractionation of extracts and crystalline and non-crystalline proteins from white kidney beans (*Phaseolus vulgaris*) by ion-exchange high-performance liquid chromatography. *Journal of Food Science* 55(3); 1990; 777-780, 836

Sodium hydroxide solution (0.02%) and citric acid solutions (0.08 N, pH 5.5, CA1; 0.60 N, pH 3.5, CA2) were used to extract proteins from white kidney beans (*Phaseolus vulgaris*). The extracts were subjected to ion-exchange high performance liquid chromatography (IE-HPLC) using a phosphate elution buffer (20 mM, pH 7.0). The charge properties of the protein fractions present in the NaOH extract and the CA1 and CA2 extracts were similar although the relative proportion of total peak area represented by each fraction was different in the different extracts. IE-HPLC of the isoelectric precipitate (amorphous microstructure) isolated from the CA1 (bipyramidal crystalline microstructure) and the CA2 (spheroidal microstructure) extracts indicated striking differences in the charge properties of the proteins which constituted the isolates. IE-HPLC also demonstrated that the precipitation processes did not affect the charge properties of the proteins which remained after the proteins were recovered from the different extracts. AS

- 2189 Tovar (J), Bjorck (IM) and Asp (N-G). Analytical and nutritional implications of limited enzymic availability of starch in cooked red kidney beans. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 488-493

Measured with an enzymic method, the starch content of a raw red kidney bean (*Phaseolus vulgaris*) flour (RBF) was higher than that of a cooked and blended (CBB) and of a cooked, freeze-dried, and milled (CBF) preparation of the seeds. Wet homogenization as well as pepsin pretreatment of CBF increased the starch yield, indicating that starch in the cooked samples is not completely available to enzymic degradation unless cell wall entrapped granules are released by mechanical or enzymatic disruption of the fibrous walls. Solubilization of resistant starch in CBF with 2 N KOH resulted in a further increase in measured starch, which reached the RBF value. Influence of encapsulated and resistant starch fractions on dietary fiber values was also noticed. CBF showed remarkably low values of in vitro amylolysis rate and starch digestibility index in a digestion/dialysis system, features that seemed to depend

also on the integrity of cell walls. AS

Lupins

- 2190 Sanz (LC) and Olias (JM). Characterization of lupin seed lipase. *Food Chemistry* 37(3); 1990; 221-228

Crude lipase has been extracted from ungerminated lupin seed. The lipase has an optimal activity at pH 5.0, an optimum temp. of 25 °C and an activation energy of 1.32 KJ mol⁻¹, showing an induction period of 10 min. A crude extract lost more than 70% of lipase activity after 24 h. Lipase activity is stimulated by the concurrent presence of K⁺ (10mM) with Ca (1 mM) or Mg (1mM) ions. The enzyme exhibits a certain specificity in releasing fatty acids from the primary rather than from the secondary position of triglycerides of lupin oil. At the primary position it is more active on saturated than on unsaturated fatty acids. AS

Mung bean starch

- 2191 Califano (AN) and Anon (MC). Differential scanning calorimetry of mung bean starch. *Journal of Food Science* 55(3); 1990; 771-773

Mung bean starch-water mixtures at water content between 13.6% and 90.2% (vol. fraction of water V_1 0.20 and 0.94) were studied by differential scanning calorimetry (DSC) and subjected to microscopic examinations afterwards. Only a monophasic endotherm appeared for water contents above 67% while for water contents between 67% and 37.3% a biphasic endotherm was found by DSC. No endothermic transition was observed for water levels below 37.3%. The melting temp. of the most perfect crystallites was correlated to the volumetric fraction of water, thus, enthalpy, entropy and extrapolated melting temp. of the transition were calculated. AS

Peas

- 2192 Rincon (F), Zurera (G), Moreno (R) and Ros (G). Some mineral concentration modifications during pea canning. *Journal of Food Science* 55(3); 1990; 751-754

Changes in the mineral content of peas (*Pisum sativum*, L.) as a function of size during commercial processing were studied. Peas were divided into four levels of maturity, and samples were taken on different sizes of peas at various stages of the canning process. Mineral content was determined by atomic absorption spectrophotometry.

Significant changes were found in the content of Cu, Fe, Mg, and Zn during commercial canning, but these were dependent on pea size only in the case of Cu, Fe and Zn. Highest total losses for Cu, and Zn were obtained in immature stages while Fe losses were highest at mature stages. AS

Pigeon peas

- 2193 Singh (U), Jambunathan (R), Saxena (K) and Subrahmanyam (N). Nutritional quality evaluation of newly developed high-protein genotypes of pigeon pea (*Cajanus cajan*). *Journal of the Science of Food and Agriculture* 50(2); 1990; 201-209

This paper reports the results of exp. carried out to compare the various aspects of nutritional quality of high protein genotypes of *Cajanus cajan* (Red gram) with two normal protein genotypes. These high protein genotypes of pigeon pea have been developed by ICRISAT, Hyderabad (India). The var. HPL 8 and HPC 40 were analysed for their nutritional quality characteristics and compared with normal protein types C11 and ICPL 211. The protein content was higher than normal types by 20% whereas the starch, the principal constituent was lower by about 8%. The higher fraction (about 7%) of globulin, the major storage protein was associated with a lower glutelin fraction in the high protein types; the amino acid pattern remaining same except that the sulphur containing amino acids methionine and cysteine were significantly higher (about 25%) in high protein types. There were no large differences in true protein digestibility, biological value and net protein digestibility between these 2 types. By cooking, the protein digestibility was improved in both seed and dhal samples. With higher utilisable protein, the nutritional quality of high-protein genotypes was found to be superior. KAR

Rice beans

- 2194 Deepinder Kaur and Kapoor (AC). Some antinutritional factors in rice bean. (*Vigna umbellata*). Effects of domestic processing and cooking methods. *Food Chemistry* 37(3); 1990; 171-179

The present investigation was conducted to study the concn. of polyphenols, phytic acid and saponins of 5 high-yielding var. of rice bean (*Vigna umbellata*) and one var. each of green gram and black gram as affected by various domestic processing and cooking methods which included soaking in tap water for 6, 12 and 18 h; sprouting for 40 and 60 h; ordinary cooking of unsoaked and soaked seeds; and autoclaving of unsoaked and soaked seeds. There was a

successive and significant reduction in the contents of antinutritional factors with increase in soaking and sprouting period. A markedly greater reduction in these factors was observed when soaked seeds were cooked and autoclaved than when unsoaked seeds were cooked and autoclaved. Among the various domestic processing and cooking methods, max. reduction of antinutritional factors was observed when soaked seeds were autoclaved. AS

OILSEEDS AND NUTS

Groundnuts

- 21 Pasha (SM). Protein as an indicator of peanut seed maturity. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 373-376

Protein as an indicator of peanut seed maturity was determined by examining protein profiles from seeds at different maturities. The results showed that peak II (arachin) and peak V increased with maturity. In contrast, the per cent of peak IV protein in relation to other proteins decreased with increasing maturity and remained unchanged toward later stages (brown and black) of seed maturity. Examination of HPLC protein profiles of different peanut cvs showed the presence of peak IV protein in all cvs, and the cvs also exhibited typical mature seed protein profile with respect to peak IV protein. The data suggested that peak IV protein would be a potential indicator of peanut seed maturity since it is found consistently in similar amounts in mature seeds of all the peanut cvs. Because of its significance as an indicator of peanut seed maturity this protein is tentatively named maturin. AS

- 2196 Muego (KF), Koehler (PE) and Resurreccion (AVA). Effect of temperature, time and number of water extractions on the physicochemical and flavour characteristics of peanuts. *Journal of Food Science* 55(3); 1990; 790-792

The effects of temp., time, and number of extractions on the colour, gas chromatographic profile, and flavour characteristics of water extracted peanuts were determined. Temp. was the major factor which affected these attributes. Increasing the extraction temp. resulted in darker coloured peanuts with less chroma, less raw peanut flavour, and more cooked peanut flavour. It also led to a significant decrease in flavour volatiles. Based on the results, the recommended conditions are to water extract at 90 °C for 10 min 3 times to produce peanuts which are light in colour and

bland in flavour. AS

Lentils

- 2197 Bhatti (RS). Cooking quality of lentils. The role of structure and composition of cell walls. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 376-383

Good- and poor-cooking samples of Eston lentil, grown under field conditions, were compared for physical (microscopic) and chem. comp. of seed, cell walls (CW), and pectin isolated from the CW. Hulled and dehulled, good- and poor-cooking samples of the lentil generally had similar hydration coeff. (water uptake). The poor-cooking sample had 44.1% lower seed phytic acid (PA) than the good-cooking sample. The CW were isolated in similar yields (3.8-4.2%) from the good and poor-cooking samples and contained 5.8-6.5% protein, 0.5-1.2% starch, 1.2-1.7% lignin, and 17.7-18.1% galacturonic acid. Arabinose, glucose, galactose, and xylose were the major CW monosaccharides. Transmission electron micrographs of cotyledons and CW of uncooked poor-cooking lentil stained with potassium permanganate showed some evidence of a signification-like mechanism under a scanning electron microscope. The CW of poor-cooking lentil appeared multilayered under a scanning electron microscope. Pectic substances of the two samples had similar methoxyl content, degree of esterification, and galacturonic acid content (colorimetric) and were thus of the low-ester var. Seed PA content seemed to play a critical role in affecting the cooking quality of lentil. AS

Soybeans

- 2198 Masuda (R), Hashizume (K) and Kaneko (K). Effect of holding time before freezing on the constituent and the flavour of frozen green soybeans (Edamame). *Journal of the Japanese Society of Starch Science* 35(11); 1988; 763-770 (Ja).
- 2199 Patil and Shukla (BD). Studies on open-sun-drying of blanched soybean. *Journal of Food Science and Technology (India)* 27(2); 1990; 116-118

Open sun-drying of blanched soybean and soy split is an important step in production of full-fat soy flour at rural level. The exp. were conducted on black polyethylene₂ sheet as drying flour at spreading densities of 3.25 kg/m², 6.5 kg/m² and 9.8 kg/m². The whole clean soybean and soy splits were subjected to blanching in boiling water for 40 min to remove antinutritional factors. The variation in moisture content was monitored by weighing samples at every one h interval during drying. The EMC was determined as per the

equation of Chung and drying constants were computed. The net drying time for soy splits was 7.5 h (< 1 day), 12 h (< 2 days), and 13 h (3 days) and 12 h (< 2 days), 12.5 h (< 2 days) and 15.5 h (3 days) for whole soybean at spreading densities of 3.25, 6.5 and 9.8 kg/m² resp. AS

Soy proteins

- 2200 Wagner (JR) and Anon (MC). Influence of denaturation, hydrophobicity and sulphydryl content on solubility and water absorbing capacity of soy protein isolates. *Journal of Food Science* 55(3); 1990; 765-770

Solubility and water absorbing capacity of commercial soy protein isolates were correlated with structural parameters. The physico-chemical properties studied were degree of protein denaturation, surface hydrophobicity and sulphydryl groups. The results indicated that solubility and water absorption were affected differently as the parameters were varied. These functional properties depended on more than one structural parameters. Solubility in 0.2M NaCl solution provided information about the degree of denaturation of soybean protein isolates. Isolates with highly denatured proteins, high surface hydrophobicity, low solubility in 0.2M NaCl solution and low SH exhibited the highest water absorbing capacity. AS

Sunflowers

- 2201 Mok (C) and Hettiarachchy (NS). Moisture sorption characteristics of ground sunflower nutmeal and its products. *Journal of Food Science* 55(3); 1990; 786-789

Moisture sorption characteristics of sunflower nutmeal products ground nutmeal, (meal, protein conc. and protein isolate) were investigated at temp. 10, 20, and 30 C, and the results were analyzed according to various sorption isotherm models. The best fit models were the G.A.B. (Guggenheim-Anderson-de Boer) model for the ground nutmeal and the cubic polynomial model for the meal, the protein conc. and the protein isolate. The Chen-Clayton model with the best-fit model for describing temp. effect in all the materials studied. The G.A.B. monolayer values were higher than the B.E.T. monolayer values for the materials studied. AS

Tiger nut

- 2202 Temple (VJ), Ojobe (TO) and Kapu (MM). Chemical analysis of tiger nut (*Cyperus esculentis*). *Journal of the Science of Food and Agriculture* 50(2); 1990; 261-263

In this paper the chem. analysis of tiger nut (*Cyperus esculentis*) has been reported. Tiger nut is a tuber that is grown and consumed widely in West Africa. This is eaten raw, soaked in water or dried and mixed with roasted peanuts. Its nutritive value and chem. comp. have been evaluated according to standard AOAC methods. Results showed that high crude lipid and carbohydrate content and its fairly good essential amino acid comp. make it a valuable source of food for both human beings and livestock in the tropics. KAR

TUBERS AND VEGETABLES

Root vegetables

Carrots

- 2203 Vijaya Sethi. Lactic fermentation of black carrot juice for spiced beverage. *Indian Food Packer* 44(3); 1990; 7-12

Process for preparation and preservation of fermented black carrot beverage has been standardized. The carrot juice was preserved by adding (i) 3% salt alone, (ii) 3% salt + 0.5% mustard (*Brassica juncea*), (iii) 3% salt + 1.0% mustard, (iv) 3% salt + 1% mustard + 0.03% sodium benzoate + 0.02% KMS and (v) 3% salt + 1.0% mustard + 0.015% sodium benzoate + 0.01% KMS. The juice was packed in glass bottles, stored at room temp. for 6 months and analysed periodically for total soluble solids; Brix, pH, acidity, anthocyanins and total microbial counts. The juice from treatment (v) was found to be the best with respect to colour retention, flavour and taste and can be further spiced and diluted before use. VKR

Cassava

Cassava flour

- 2204 Okagbue (RN). Identification of yeasts and aerobic spore forming bacteria from cassava flour. *Food Microbiology* 7(1); 1990; 27-32

Yeasts and *Bacillus* sp. isolated from cassava flour were identified by two simplified identification schemes. The most common yeast was *Candida krusei*, which occurred in 20 out of 36 (approx. 56%) of all the samples examined. Other yeasts included *Brettanomyces clausenii*, *Candida magnoliae*, *C. wickerhamia*, *Geotrichum fermentans*, *Pichia*

fluuxum, *Rhodotorula glutinis*, *Saccharomyces cerevisiae*, *S. kluyveri* and *Williopsis californica*. Three isolates could not be identified. *Bacillus stearoothermophilus*, *B. coagulans* and *B. brevis* were the most common among the *Bacillus* isolates. Those of the intermediate category were *B. circulans*, *B. megaterium* and *B. subtilis*, while *B. firmus*, *B. lentus*, *B. licheniformis*, *B. polymyxa* and *B. pumilus* were relatively uncommon among the samples. Unidentifiable strains were isolated in approx. 39% of the samples examined. Although the simplified identification schemes used in this work were satisfactory for identifying many of the isolates, identification of yeast which relied on cell measurements was generally unreliable. AS

Potatoes

- 2205 Jacusen (D). Patatin purification by hydrophobic interaction chromatography. *Journal of Food Biochemistry* 13(6); 1989; 453-456

A potato glycoprotein, patatin, was originally isolated by concanavalin A- (Con A) Sepharose chromatography. An equally successful method was developed using Octyl-Sepharose. The new method was applicable to cultivated and wild *Solanum* sp. AS

Yams

- 2206 Ajayi (OA) and Madueke (LU). A study on weight loss of stored yam (*Dioscorea cayenensis*) as affected by the ventilation of the storage locations. *Journal of the Science of Food and Agriculture* 50(2); 1990; 257-260

A study on wt. loss of stored yam (*Dioscorea cayenensis*) as affected by the ventilation of the storage locations has been carried out and results presented in this paper. The tubers were stored at 3 ventilation locations (1.4%, 3.8% and exposed ventilation) in two storage environments. It was found that with higher ventilation levels the wt. loss was greater. The tubers which were exposed and subjected to direct heating and cooling of the sun and rain resp. perished. The high temp. prevented the sprouting of the tubers whereas the tubers at 1.4% and 3.8% ventilation levels outside took a longer time to sprout than those stored inside. KAR

Vegetables

- 2207 Fuchigami (M). Differences between bamboo shoots and vegetables in thermal disintegration of tissues and polysaccharides fractionated by successive extraction.

Journal of Food Science 55(3); 1990; 739-745

Bamboo shoots were more difficult to disintegrate during cooking than other vegetables (potato, Japanese radish, carrot, burdock, and East Indian lotus). The pectic substances of bamboo shoots were fractionated with three reagents. The uronic acid comp. of HCl-soluble pectin (PA), acetate buffer-soluble pectin (PB) and sodium hexametaphosphate-soluble pectin (PC) were about 8-10%, 2-4%, and 88%, resp. Conversely, the other vegetables contained only a small amount of PC and completely disintegrated after the extraction of PA and PB; bamboo shoots retained considerable firmness under the same conditions. Acidic polysaccharides in bamboo shoots separated by DEAE-cellulose column chromatography contained large amounts of neutral sugars. This suggested that the glucose and xylose rich PC (low methoxyl pectin) affected the solubilization of pectic polysaccharides and thermal disintegration of bamboo shoots. AS

- 2208 LaBorde (LF) and von Elbe (JH). Zinc complex formation in heated vegetable purees. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 484-487

Zinc complex formation with pyropheophytin alpha- was studied on vegetable purees in order to further understand metallo complex formation during thermal processing. Zinc pyropheophytin alpha formation was dependent on added Zn^{2+} ion, pigment concn., and pH. Pea puree heated to 60 min at 121 C with 150 and 300 p.p.m. added Zn^{2+} ion contained 3 and 9 times more zinc pyropheophytin than a puree containing 75 p.p.m. Zn^{2+} ion. Spinach puree with 75 p.p.m. Zn^{2+} ion added with 12 times the pigment concn. compared to pea puree, contained approx. 40 times more Zn complex than similar pea puree heated at 121 C for 60 min. Increasing the pH value of the spinach puree from 4.0 to 8.5 resulted in an 11-fold increase in Zn pyropheophytin formed after heating at 121 C for 90 min. Green colour of the puree, as measured by Hunter colour value (-a), followed Zn complex formation. AS

Cucumbers

- 2209 Humphries (EG) and Fleming (HP). Anaerobic tanks for cucumber fermentation and storage. *Journal of Agricultural Engineering Research* 44(2); 1989; 133-140

Fermentation in NaCl brine by naturally occurring microorganisms is an established procedure for temporary preservation of cucumbers in open-top tanks. The physical attributes and accessory supporting equipment of an

anaerobic, closed-top tanking system with the potential to reduce environmental problems and facilitate the use of new fermentation technology is reviewed and updated. Prototype tanks of 30 to 35 m³ capacity and fibreglass construction having a food-grade liner were selected for introductory stage testing and semi-commercial evaluation. Anaerobic conditions were achieved by sealing the manhole port located at the tank top and purging the brine with N gas to remove O. The purging (at rates up to 1.0 M³ h) served to remove carbon dioxide generated during fermentation and also operated as a gas lift pump to circulate the cover brine. During fermentation N and carbon dioxide gases were vented from the tank top through a 50 mm diameter vent tube at atm. pressure. During storage, anaerobic conditions were maintained by a slight (approx. 250 mm water column) positive pressure of N in the headspace above the liquid level; a U-tube manometer served as means of isolation, a pressure indicator and a safety device against excessive positive or negative tank pressures. Field trials to the system under commercial conditions have demonstrated that anaerobic tanks can alleviate many of the objectional features of open-top tanks. Implications of projected modifications of the system are briefly examined. AS

Cucumber pickles

- 2210 Kuwahara (Y); Otsuka (N) and Manabe (M). Effects of pectin-pullulan-chitosan on texture and pectin components of cucumber pickles. *Journal of the Japanese Society of Starch Science* 35(11); 1988; 776-780 (Ja).

In order to improve the texture of cucumber pickles, the effect of addition of natural polysaccharides (low methoxyl and high methoxyl pectin, pullulan, chitosan) on firmness, instead of adding CaCl generally used, was studied by analyzing the characteristic properties of pectin components of cucumber pickles. 1. The effect of low methoxyl and high methoxyl pectin, and pullulan on texture improvement of cucumber pickles was not found. 2. On chitosan treatment, the firmness of cucumber pickles definitely increased as the amount of chitosan increased. 3. With increase in the added amount of chitosan, hexametaphosphate soluble pectin (PSP) decreased, while hydrochloric acid soluble pectin (HSP) and sodium hydroxide soluble pectin (SSP) increased. Firmness was found to increase in proportion to the increase of the ratio of HSP and SSP in total pectin. AS

Lettuce

- 2211 Beuchat (LR) and Brackett (RE). Survival and growth of

Listeria monocytogenes on lettuce as influenced by shredding, chlorine treatment, modified atmosphere packaging and temperature. *Journal of Food Science* 55(3); 1990; 755-758, 870

The effects of shredding, chlorine treatment and modified atm. packaging on survival and growth of **Listeria monocytogenes**, mesophilic aerobes, psychrotrophs and yeasts and molds on lettuce stored at 5 C and 10 C were determined. With the exception of shredded lettuce which had not been chlorine treated, no significant changes in populations **L. monocytogenes** were detected during the first 8 days of incubation at 5 C; significant increases occurred between 8 and 15 days. Significant increase occurred within 3 days when lettuce was stored at 10 C; after 10 days, populations reached 10^8 - 10^9 CFU/g. Chlorine treatment, modified atm. (3% O, 97% N) and shredding did not influence growth of **L. monocytogenes**. It was concluded that **L. monocytogenes** is capable of growing on lettuce subjected to commonly used packaging and distribution procedures used in the food industry. AS

Parsnip

- 2212 Siddiqui (IR) and Emery (JP). Studies on vegetables. Investigation of arabinan from parsnip (*Pastinica sativa*). *Journal of Agricultural and Food Chemistry* 38(2); 1990; 387-389

An arabinan isolated from parsnip was shown by sedimentation studies to be homogeneous, and methylation revealed a highly branched structure. Hydrolysis of the fully methylated polysaccharide yielded 2, 3, 5-tri-O-methyl-L-arabinose (11 mol), 2,3-di-O-methyl-L-arabinose (20 mol), 3-O-methyl-L-arabinose (trace), 2-O-methyl-L-arabinose (7 mol), and L-arabinose 92 mol). The general structural features of the arabinan are discussed. AS

Pumpkins

- 2213 de Cayuela (RG), Guaipo (B) and Villavivencio (D). Preparation and evaluation of a precooked blend from pumpkin squash (*Cucurbita maxima*) and rice flour, enriched with oilseed proteins and/or skimmed milk powder. *Archivos Latinoamericanos de Nutricion* 38(1); 1988; 143-151 (Es).

The purpose of the present study was the production of a precooked blend made of pumpkin squash and rice flour (PRB), processed with drum dryer. The blend was supplemented with different protein sources; soy, sesame and defatted milk. The following formulations were obtained: 1) PRB +

10.5% deffated soy flour; II) PRB + 15% deffated milk; III) PRB + 5% deffated sesame flour 10% deffated milk; IV) PRB + 5% deffated soy flour + 10% deffated sesame flour, and V) PRB + 9.5% deffated soy flour + 9.5% deffated milk. All formulations were submitted to physico-chemical, nutritional and sensorial evaluation. The protein content of the formulations varied from 14.6% to 17.9%. Rat assays gave satisfactory net protein ratio values. Soups prepared with the formulations were qualified as having good organoleptic characteristics. The production of some of the formulation described above, contribute in a larger utilization of pumpkin as it would allow the easy preparation of salted and sweetdishes (soups, cakes, etc.). AS

Tomatoes

Tomato sauces

- 2214 Satyanarayana Bhamidipati and Singh (RK). Flow behaviour of tomato sauce with or without particulates in tube flow. *Journal of Food Process Engineering* 12(4); 1990; 275-293

Viscosity and density are two properties of fluid that are affected by temp. changes. The flow behaviour of tomato sauce (7 and 14 Brix in a tube viscometer was studied at varying concn. of added particulates (2 and 5 wt%) at temp. in the range of 70 to 95 C. The results indicate that the Power Law model described the flow behaviour of the non-Newtonian fluids better than the Casson model. The effects of temp. concn. of carrier fluids and particulates on the flow behaviour indices and viscosity was studied. The effect of temp. on the flow behaviour index (n) and consistency index (K) were modeled as exponential relationships. The values of N and K for 7 Brix sauce ranged from 0.30 to 0.86 and 0.04 to 0.34, resp. For the 14 Brix sauce these values were f0.27 to 0.53 and 0.20 to 0.60 resp. The values of N decreased and K increased with increase in concn. of solids and particualtes. The relative changes in K and N were lower for higher concn. of solids and particulates. It was found that temp. had a greater effect on K than on N. The effect of temp. on viscosity was modeled as an Arrhenius type equation from which the activation energies were calculated. The combined effects of temp., concn. of solids in the sauce and added particulates on apparent viscosity can be predicted by a non-linear model. AS

FRUITS

- 2215 Gkinyele (IO), Keshinro (OO) and Akinlawo (OO). Nutrient losses during and after processing of pineapples and oranges. *Food Chemistry* 37(3); 1990; 181-188

Samples of pineapples and oranges processed into various products at the Lafia Canning Factory, Ibadan, were obtained and analysed for their ascorbic acid, pH, total titratable acidity, total solids, ash and contents of Ca, Mg, Na and K. The sugars present in the samples were estimated both quantitatively and qualitatively. Samples of the pasteurized pineapple pieces, pasteurized pineapple juice and pasteurized orange juice were stored at room temp. for 3 months followed by chem. analyses. Ascorbic acid content of the fresh fruit juices was reduced considerably with processing and storage. Both the pasteurized and unpasteurized orange juice were acidic as evidenced by the pH and total titratable acidity values obtained in this study. The pineapple products were, however, less acidic. Total solids, ash and the selected minerals were present in appreciable amount in the fruit products and were not significantly affected by processing and storage. Qualitatively, pasteurized pineapple juice and pieces contained glucose, fructose and sucrose in appreciable amounts while pasteurized orange juice contained only glucose and fructose with traces of maltose but no sucrose. AS

- 2216 Aremu (CY) and Udoessien (EI). Chemical estimation of some inorganic elements in selected tropical fruits and vegetables. *Food Chemistry* 37(3); 1990; 229-234

The levels of four macroelements-Ca, Mg, K and N and four microelements-Cu, Fe, Mn and Zn were determined by atomic absorption spectrophotometry or flame photometry in the edible portions of a variety of raw fruits and vegetables; namely, banana, plantain, African pear, lime, orange, cucumber, cabbage, okra, onion, pepper, pumpkin, leaf, tomato and waterleaf. The vegetables, especially the green leafy ones, were found to contain the highest levels of most of the elements, with few exceptions. AS

- 2217 Canepa (P), Rognoni (U), Gherardi (S) and Calgari (S). Membrane processes for the production of concentrated fruits. *Industria Alimentari* 28(277); 1989; 1167-1172, 1174 (It).

- 2218 Mastrocola (D), Severini (C), Barbanti (D) and Pinnavala (G). Air drying of fruit. Effects of some pretreatments.

Industrie Alimentari 28(277); 1989; 1175-1178, 1182 (It).

Describes a new drying technology which allows to obtain dried products with high quality, but to inhibit the enzymatic browning, sulphur dioxide is used. The effect of different pretreatments on drying rate and on quality of dried apple have been compared. Results indicate that pretreatments like blanching, osmo-blanching and direct osmosis can substitute sulphur dioxide in fruit and vegetable drying. BV

- 2219 Mehta (MB) and Dodd (NS). Sodium and Potassium contents of selected processed fruits and vegetables. **Journal of Food Science and Technology (India)** 27(2); 1990; 119-122

The Na and K contents were determined in processed fruits, vegetables and their products. It was observed that processing has affected both Na and K contents and their ratio in fruits and vegetables. However, the change was more significant for canned vegetables than frozen vegetables or their products. AS

- 2220 Sasidhar Babu (AK) and Mahadeviah (M). Nitrate induced corrosion in canned fruit and vegetable products. **Indian Food Packer** 44(3); 1990; 13-21

A brief review dealing with aspects like the mechanism of nitrate induced corrosion in canned fruit/vegetable products; sources of nitrate; factors responsible for triggering the reaction including pH, Cu and Fe ions, head space oxygen; nitrate induced corrosion occurring in individual products like tomato, green beans, ivy gourd, spinach, orange juice and papaya slices; and the possibilities of reducing the nitrate induced corrosion. 15 references. KAR

Apples

- 2221 Nayital (RK), Chopra (SK) and Sharma (YP). Effect of postharvest application of calcium chloride, fungicides and wax emulsion on the storage behaviour of apple cv. Red Delicious. **Indian Food Packer** 44(3); 1990; 31-38

'Red Delicious' apple grown in high hill region of Himachal Pradesh (India) were after harvest treated with CaCl₂, Bavistin, Euphorbia latex, frutox and diphenylamine(DPA) and their effect on the ripening and storage quality was assessed. The treatments were given by dipping the fruits in CaCl₂ 4%; CaCl₂ 2%; Bavistin 500 p.p.m., CaCl₂ 4% + Bavistin 500 p.p.m.; CaCl₂ 2% + Bavistin 500 p.p.m. Euphorbia latex 0.01%. Frutox wax emulsion 6%; DPA

1000 p.p.m., and analysed for chem. and physiological changes during 210 days of storage. The fruits hydrocooled in either 2% CaCl or 2% CaCl + Bavistin 500 p.p.m. were more effective in prolonging shelf life of fruits from 210 days as against 180 days for control. It retarded the loss in fruit wt., vol., the breakdown of flesh-firmness and reducing the respiration rate over the 210 days storage period at 0 C + 1; RH 85-90%. Total soluble solids and titrable acidity was highest in treated fruits compared to control. The % loss by rot was lowest in fruits dipped in Bavistin (500 p.p.m.), DPA (1000 p.p.m.) and CaCl (2% or 4%) and their combination with Bavistin (500 p.p.m.). VKR

Apricots

- 2222 Takeoka (GR), Flath (RA), Mon (TR), Teranishi (R) and Guentert (M). Volatile constituents of apricot (*Prunus armeniaca*). *Journal of Agricultural and Food Chemistry* 38(2); 1990; 471-477

Volatile constituents of fresh apricots (*Prunus armeniaca*) of the Blenheim var. were analyzed by capillary gas chromatography and gas chromatography-mass spectrometry. The fruit was sampled by simultaneous vacuum steam distillation-extraction. A total of 49 components were identified in the extract, including 25 constituents reported for the first time in apricot. Linalool, lactones, and C₆ lipid peroxidation products were the major constituents in the extract. Odour unit values, calculated from conc. and odour threshold data, indicate that the following compounds are major contributors to blended apricot aroma beta-ionone, linalool gamma-decalactone, hexanal, (E)-2-hexenal, (E,E)-2,4-decadinenal, (E)-2-nonenal, and gamma-dodecalactone. Headspace analyses of the intact fruit led to the identification of 83 components, 60 of which had not been previously reported in apricot. Esters were the dominant constituents in the headspace samples. AS

Apricot jam

- 2223 Guichard (E), Schlich (P) and Issanchou (S). Composition of apricot aroma. Correlations between sensory and instrumental data. *Journal of Food Science* 55(3); 1990; 735-738

Volatile compounds of 6 apricot cvs were isolated by vacuum distillation and separated by gas-chromatography. Eleven aromatic compounds were selected by sniffing and quantified after addition of known amounts of pure compounds. Sensory analyses were performed to rate the typicality of apricot aroma in these cvs. Since the chem.

extracts were not assessed significantly different from the raw products, statistical analyses were performed to correlate the typical sensory notes with the instrumental data. A correspondence analysis showed that cvs could be separated into 3 clusters, according to their typical aroma. Hexyl acetate, gamma-octalactone and gamma-decalactone were shown to be key compounds for the apricot flavour whereas benzaldehyde could have a negative impact on the aroma of the less aromatic cvs but would favourably complete the typical aroma of "Rouge du Roussillon". AS

Ciders

- 2224 Leguerinel (I), Mafart (P), Cleret (JJ) and Bourgeois (C). Yeast strain and kinetic aspects of formation of flavour compounds in cider. *Journal of the Institute of Brewing* 95(6); 1989; 405-409

An apple juice was fermented at 8 C using 12 strains of *Saccharomyces uvarum*. Glucose, fructose, malic and L-lactic acids, isobutanol 2,3 butanediol, isoamyl alcohol, ethyl acetate and titratable acidity were determined and monitored in the course of fermentation. It was observed that yeast strains differed from one another mainly in fermentation rates. When components were determined in ciders of the same remaining fructose concn., rather than after the same fermentation time, the only significant effect of the yeast strain was on the amounts of glucose and ethanol in sweeter cider (fructose 34 g/litre), or on the amounts of glucose, acetic acid, isobutanol and amyl alcohols in dryer ciders (fructose 17 g/liter). A sensory analysis showed that standard deviations of concn. of remaining or formed components in ciders fermented by different yeast strains, was sufficient to be detected by the taste panel. Added glucose in this range of concn. (1.5 g/liter) in cider reduced the perception of sourness while the addition of acetic acid (0.3 g/litre) reduced the perception of the scented flavour. Added isobutanol (6 mg/litre) reduced the perception of sweetness. No significant effect of added isoamyl alcohol (30 mg/litre) could be detected. Chem. detn. were correlated by means of regression equations derived from earlier work with some organoleptic characteristics. No anticipated effect of the yeast strain could be detected on any studied flavour characteristic. It is concluded that in ciders of the same attenuation, the effect if it does exist, of the *S. uvarum* strain isolated from ciders, must be low. AS

Ker

- 2225 Sadasivam Nair (S), Verma (SS) and Inder Mohan Verma).

Curing of Ker (*Capparis decidua*) fruit standardised. *Indian Food Packer* 44(3); 1990; 23-26

Ker is a nutritious fruit grown in arid and semi-arid regions of India. It has an astringency and 20 formulations comprising of butter milk, salt, lactic acid, acetic acid, turmeric powder, mustard powder, quick lime were used to cure the fruits. The cured fruits were evaluated by a panel of judges. Of the 20 formulations, the formulation consisting of (i) butter milk + salt (10%), (ii) acetic acid (4%) + salt (10%), (iii) lactic acid (3%) + salt (10%) and mustard (2%) + salt (10%) were found highly acceptable. Fruits cured by butter milk + salt (10%) were best in taste and fruits cured in lactic acid (2%) + salt (10%) were better in aroma and flavour. These could be stored for > 60 days at room temp. KAR

Mangoes

2226 Badiyala (SD) and Awasthi (RP). Evaluation of some mango (*Mangifera indica* L.) cultivars on the basis of physico-chemical characters under Kangra valley conditions of Himachal Pradesh. *Indian Food Packer* 44(3); 1990; 27-30

12 Mango cvs. grown in Kangra valley, Himachal Pradesh, India were evaluated for physical and chem. characters. The fruit wt. and length were higher in Fazri cv. (523.33 g; 14.56 cm resp.) whereas 'Mallika' cv. had greater diameter (8.06 cm). Max fruit pulp (68%) was obtained with cv. 'Mallika'. The total soluble solids ((TSS) (19.20%)), TSS acidity ratio (83.53), reducing (3.47%) and non-reducing (12.66%) sugars and ascorbic acid (16.33 mg/100 g) contents were highest in cv. 'Dashehari' and hence cultivation of this var. in Himachal Pradesh was recommended. VKR

Passion fruits

2227 Winterhalter (P). Bound terpenoids in the juice of the purple passion fruit (*Passiflora edulis* Sims). *Journal of Agricultural and Food Chemistry* 38(2); 1990; 452-455

Enzymatic hydrolysis of C₁₈ reversed-phase isolates from the juice of the purple passion fruit led to the identification of wide range of terpenoids. In addition to the main component linalool and other monoterpenoids, the following C₁₃ norterpenoid aglycons were identified for the first time in passion fruit; 4-hydroxy-beta-ionol; 4-oxo-beta-ionol; 4 hydroxy-7,8-dihydro-beta-ionol; 4-oxo-7,8-dihydro-beta-ionol; 3-oxo-alpha-ionol; isomeric 3-oxoretro-alpha-ionols; 3-oxo-7,8-dihydro-alpha-ionol; 3-hydroxy-1,1,6-trimethyl-1,2,3,4-tetrahydronaphthalene; vomifoliol;

dehydrovomifoliol. AS

Peaches

- 2228 Chapman (GWJr) and Horvat (RJ). Changes in non-volatile acids, sugars, pectin, and sugar composition of pectin during peach (cv. Monroe) maturation. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 383-387

Changes in soluble sugars, non-volatile acids, pectin content and the sugar comp. of isolated pectin were determined during Monroe peach maturation from 80 days after flowering (DAF) until about 2 wks after the beginning of fruit drop (130 DAF). Sucrose and sorbitol showed the largest changes of all carbohydrates measured. Quinic was the major acid in immature fruit but rapidly decreased during maturation. Malic became the major acid during final growth stages, and the increase in malic acid to citric acid ratios closely paralleled the time at which sucrose reached max. levels. Total pectin levels increased linearly in immature fruit but leveled off about the time sucrose began its second sigmoidal increase. The carbohydrate comp. of pectin also changed more during the linear increase in total pectin but remained fairly constant after total amounts leveled off. The time at which sucrose levels and malic acid to citric acid ratios reached maxima and quinic acid levels were lowest could be used as reliable indices of peach physiological maturity. AS

Strawberries

- 2229 Wesche-Ebeling (P) and Montgomery (MW). Strawberry polyphenoloxidase. Its role in anthocyanin degradation. *Journal of Food Science* 55(3); 1990; 731-734, 745

Two purified fractions of strawberry polyphenoloxidase (PPO) were used in model systems containing D-catechin alone or in combination with either pelargonin or cyanin. K_m values using D-catechin were 0.5 mM and 0.41 mM and V_{max} 82,700 and 18,800 nmoles oxygen/min/mg protein, resp., for each isozyme. Reaction of PPO with D-catechin led to the formation of yellow-brown pigments with max. absorbance at 390 nm. Little PPO activity could be detected using cyanin as a substrate and no activity with pelargonin. PPO and D-catechin together caused the loss of 50 to 60% of the anthocyanin pigments after 24 h at room temp. with the formation of a precipitate. AS

CONFECTIONERY, STARCH AND SUGAR

Confectionery

Chocolates

- 2230 Hachiya (I), Koyano (T) and Sato (K). Observation of seeding effects on fat bloom of dark chocolate. *Food Microstructure* 8(2); 1989; 257-261

Surface microstructures and polymorphism of seeded dark chocolate were observed with cryo-SEM, to clarify the effects of seeding on fat bloom stability of dark chocolate. Two thermal tests, cycling between 32 and 20 C (32/20) and 38 and 20 C (38/20), were applied to examine the fat bloom stability of the chocolate. Three crystalline powders: Form VI of cocoa butter; the most stable β_1 form of SOS (1,3-distearoyl-2-oleoylglycerol); and the second stable β_2 form of BOB (1,3-di-behenoyl-2-oleoylglycerol) as seed materials are used. Seeding with cocoa butter (Form VI) and SOS (β_1) at concn. of 0.5 - 1 wt.% showed good fat bloom stability in the 32/20 test. In the case of the 38/20 test, however, fat bloom was not prevented. Seeding with BOB (β_2) gave the best fat bloom stability in both thermocycles; in particular, 5 wt. % (β_2) completely prevented fat bloom after the 38/20 test. AS

Starch

- 2231 Yano (T) and Nagai (T). Fractal surface of starchy materials transformed with hydrophilic alcohols. *Journal of Food Engineering* 10(2); 1989; 123-133

A fractal analysis and a transformation of the surface structures of native potato starch, wheat flour, and rice flour were attempted. Log-log plots of the specific surface area versus the mean particle diameter showed that the surfaces of these materials were fractal. Transformation with ethanol and freeze-drying not only increased the specific surface area up to about 25 m²/g for the potato starch gel powder, but also increased the fractal dimension from about 2.3 to about 3.0 for each material. Scanning electron micrographs of the native and transformed potato starch powders are shown. AS

BAKERY PRODUCTS

- 2232 Oda (Y) and Ouchi (K). Role of yeast maltose fermentation

genes in carbon dioxide production rate from sponge dough. *Food Microbiology* 7(1); 1990; 43-47

The time course of carbon dioxide production in sponge dough fermentation (Fermogram) was compared in yeast strains carrying various MAL (maltose fermentation) genes. Most MAL-constitutive strains showed curves with a significant increase after 1-1.5 h, fermenting maltose liberated from starch by endogenous amylases. However, all MAL-inducible strains and maltose non-fermenting strains gave quite different curves which remained low, indicating their poor leavening ability in sponge dough. AS

Bread

- 2233 Venkateswara Rao (G) and Indrani (D). Comparative suitability of resultant atta and whole wheat flour for brown bread. *Journal of Food Science and Technology (India)* 27(2); 1990; 89-92

Studies on blends of commercial wheat flour i.e. maida (WF) and resultant atta (RA) from roller flour mill or whole wheat flour (WWF) from disc mill (chakki) showed gradual increase in ash (0.57 to 1.61%), protein (8.78 to 9.26%), colour grade value (4.1 to > 18), damaged starch (12.1 to 18.6%), diastatic activity (149 to 304 mg maltose/10 g of flour), farinograph water absorption (55.2 to 71.4%), dough development time (4.5 to 7.0 min) and decrease in sedimentation value (19 to 6.5 ml), dough stability (8.0 to 5.5 min), extensograph area (> 113 to 66 cm²) and amylograph peak viscosity (2420 to 1310 AU), as the RA/WWF content increased. Breadmaking characteristics of blends showed increase in loaf wt. (132.8 to 147.0 g) decrease in loaf vol. (475 to 354 ml), crumb score (7.5 to 2.3) and crumb softness, as the RA/WWF content increased. The results indicated the possibility of preparing good quality brown bread using 60% RA or 40% WWF in the blend. AS

Pancakes

- 2234 Seguchi (M). Effect of heat-treatment of wheat flour on pancake springiness. *Journal of Food Science* 55(3); 1990; 784-785

Pancakes baked with heat-treated wheat flour increased in springiness (recovery from compression) and decreased in gumminess. Brabender Amylograph tests of heat-treated wheat flours (at 120 C for 0, 1.0, 2.0, 3.0, and 5.0 h) also showed the first viscosity-increase of the flour-water slurries started at lower temp. when duration of the heat-treatment was increased. The property changes brought about

by heat-treatment are consistent with properties of chlorinated wheat flour. AS

MILK AND DAIRY PRODUCTS

- 2235 Dhaliwal (NS) and Khattra (PS). Cost-volume analysis of dairy plant. *Indian Dairyman* 42(6); 1990; 278-281

Attempt is made to determine the nature of relationship between cost of procurement and milk cost on one hand and between processing costs and milk cost on the other by fitting linear, log linear, polynomial and transcendental type functions. The study conducted with 4 dairy plants indicated that higher the quantity of milk processed, lower would be the incremental processing cost. SRA

- 2236 Kang (Y-J) and Frank (JF). Comparison of airborne microflora collected by the Andersen sieve sampler and RCS sampler in a dairy processing plant. *Journal of Food Protection* 52(12); 1989; 877-880

The performance of a Reuter centrifugal air sampler (RCS sampler) was compared with that of an Andersen 6-stage sieve sampler (Andersen impactor) to determine the suitability of the RCS sampler for monitoring airborne microflora in dairy processing plant environments. The types of microorganisms recovered from non-mold colony forming particles using the Andersen impactor and the RCS sampler were different at each location and trial. When selected Gram-positive cocci and Gram-negative rods were classified using Staph track and API 20E System, resp., results indicated that the type of bacteria collected using each sampler was similar, though the percentage distributions were different. In addition, bacterial types were not consistently associated with different size particles. The RCS sampler was able to recover most bacterial types since these types were distributed over various particle sizes. When airborne fungi were collected, the RCS sampler recovered significantly lower amounts than that of Andersen impactor. The RCS sampler is suitable for use when approx. concn. of non-mold airborne particles, or relative degree of air cleanliness information is needed. AS

- 2237 Kratzer (FH), Bersch (S) and Vohra (P). Evaluation of heat-damage to protein by Coomassie blue G dye binding. *Journal of Food Science* 55(3); 1990; 805-807

A rapid, simple method is described which may be useful

for detn. of heat-damage to proteins in processed foods. It uses the Coomassie Blue dye-binding (DB) capacity of food proteins extractable in 0.2% KOH, with lysozyme as reference standard. The presence of glucose or lactose was essential to reduce DB capacity of casein on autoclaving. The DB capacity, on dried basis of fat-free milk, whole egg, egg white, or blood was reduced rapidly with autoclaving, but not that of gelatin and gluten. The DB capacity of extracted soybean flakes, mung bean and black-eyed pea beans was reduced gradually as the time of autoclaving was increased. AS

- 2238 Paul (SC). Nutritive beverages for product diversification in dairy industry. *Indian Dairyman* 42(6); 1990; 282-287

Article covers preparation of skim milk based fermented beverages; whey based beverages; flavoured whey drinks; cultured whey drinks; alcoholic beverages from whey and buttermilk beverages. This product diversification will bring economic returns and proper utilization of dairy by-products. SRA

- 2239 Ramesh (K) and Yadav (JS). Biotechnological applications in dairy processing. *Indian Dairyman* 42(5); 1990; 264-268

The biotechniques commonly employed as tools in biotechnology like genetic manipulation, recombination, transformation, transduction, conjugation, protoplast fusion, recombination and immobilisation of enzymes and cells have been briefly described. The biotechnology applications covered are starter cultures, cheese, cheese starters, rennet and other enzymes, accelerated ripening, lipolysis, controlled gas formation, by-product utilisation, lactose-free milk, nutritional, supplements, biosweeteners and effluent treatment. SRA

- 2240 Shi (Y), Liang (B) and Hartel (RW). Crystallization kinetics of alpha-lactose monohydrate in a continuous cooling crystallizer. *Journal of Food Science* 55(3); 1990; 817-820

The crystallization of alpha-lactose monohydrate in a continuous cooling crystallizer was investigated at various temp. and supersaturations. The population balance model was used to analyze the product crystal size distribution as determined by the Coulter Multi-Sizer for each condition studied. Nucleation and growth values were thereby determined for each temp. and supersaturation. Kinetic models were then developed for both nucleation and growth to demonstrate the effects of the operating parameters. The results showed that the nucleation process had a temp. dependence with an activation energy of 17.0 kcal/mole and

that nucleation increased with the 1.9 power of supersaturation and the 1.0 power of the suspension density (mass of crystals). The growth process was found to have a temp. dependence with an activation energy of 22.1 kcal/mole and to be a second order function of the supersaturation. AS

Milk

- 2241 Augustin (M-A) and Clarke (PT). Effects of added salts on the heat stability of recombined concentrated milk. *Journal of Dairy Research* 57(2); 1990; 213-226

Changes in heat stability and Ca^{2+} activity of recombined concentrated milk (18% solids non-fat: 8% fat) induced by the additions of 0.011-0.217 mol. phosphate/kg skim milk solids (SMS), 0.022-0.217 mol. citrate/kg SMS, 0.011-0.022 mol. Ca/kg SMS and 0.016-0.067 mol. EDTA/kg SMS were evaluated. Heat stability was assessed using an objective method which involved detn. of viscosity after heating under controlled conditions. Low levels of added phosphate and citrate generally effected an acid shift of the viscosity pH profile, while higher levels caused a broadening of the profile. Addition of CaCl at a level of 0.011 mol/kg SMS resulted in a narrowing of the viscosity-pH curve; additions of higher levels resulted in a non-heat stable recombined milk conc. EDTA also caused a narrowing of the viscosity-pH curve. The results highlight the importance of pH control for effective stabilization of recombined milk conc. by additions of phosphate and citrate. AS

- 2242 Batish (VK), Sunita Grover and Ranganathan (B). Occurrence of enterococci in milk and milk products. III. Enterocin typing of deoxyribonuclease positive enterococci and epidemiological significance. *Journal of Food Science and Technology (India)* 27(2); 1990; 97-101

Among the 22 DNase positive enterococci recovered from 208 samples of milk and milk products and 24 sources other than dairy products, 83.9% were enterocin typable. Of these, 28 belonged to *Streptococcus faecalis* var. *faecalis*, 16 to *S. faecalis* var. *zymogenes*, 87 to *S. faecalis* var. *liquefaciens*, 51 to *S. faecium* and 6 to *S. durans*. Sixteen enterocin patterns were noticed among *S. faecalis* and its var. The most predominant type was 65-603 followed by 10541 and X-9. Similarly, nine enterocin patterns were observed among *S. faecium* and *S. durans*. Among these, enterocin type X-9 was the most predominant. Enterocin patterns found among enterococci isolated from milk and milk products were also observed among the enterococci recovered from other

non-dairy sources. Enterocin type X-9 recovered from both dairy and non-dairy sources was the most prevalent (29.2%) either singly or in combination with the other types followed by types 10541 (15.4%) and 65-603 (14%). The epidemiological significance of enterocin typing of enterococci has been discussed. AS

- 2243 D'Aoust (J-Y). Manufacture of dairy products from unpasteurized milk. A safety assessment. *Journal of Food Protection* 52(12); 1989; 906-914

The prevalence of *Salmonella*, *Campylobacter*, and *Yersinia* spp. in the food chain, and the more recent emergence of *Listeria monocytogenes* and hemorrhagic *Escherichia coli* as foodborne pathogens, are of public health concern. The ability of some of these bacterial agent to grow in milk and dairy products, to survive prolonged periods of refrigerated storage, and to withstand thermal treatments of raw milk at subpasteurizing temp., place new emphasis on the need for stringent control of milk processing operations and plant environment. Mandatory use of pasteurized milk may provide the only viable option for production of pathogen-free milk products. AS

- 2244 El-Dairouty (KR). Staphylococcal intoxication traced to non-fat dried milk. *Journal of Food Protection* 52(12); 1989; 901-902

- 2245 Farrag (SA) and Marth (EH). Growth of *Listeria monocytogenes* in the presence of *Pseudomonas fluorescens* at 7 or 13 C in skim milk. *Journal of Food Protection* 52(12); 1989; 852-855

Autoclaved samples of skim milk were inoculated with *Listeria monocytogenes* (strain Scott A. California or V7), *Pseudomonas fluorescens* (strain P26 or B52), or a combination of *L. monocytogenes* plus *P. fluorescens*, and incubated at 7 or 13 C for 8 wk. McBride *Listeria* Agar was used to determine populations of *L. monocytogenes* (at 0, 7, 14, 28, 42, or 56 days), and *Pseudomonas* isolation agar to enumerate *P. fluorescens*. Growth of *L. monocytogenes* was somewhat enhanced after 7 days of incubation at 7 but not at 13 C in the presence of pseudomonads. However, after 14 days and until the end of the incubation period (56 days), slight inactivation of *L. monocytogenes* in the presence of *P. fluorescens* was observed. *L. monocytogenes* did not affect growth or survival of *P. fluorescens*; also, no marked changes in pH of the milk were caused either by *L. monocytogenes* alone or by *L. monocytogenes* plus *P. fluorescens*. AS

- 2246 Ferrari (G), Meerdink (G) and Walstra (P). Drying kinetics

for a single droplet of skim-milk. *Journal of Food Engineering* 10(3); 1989; 215-230

A theoretical model for the drying history of a single droplet is presented. Diffusion in the solidifying droplet was considered as the controlling transport mechanism. The dependence of the water diffusion coeff. on temp. and water concn. was estimated from exp. on droplets of skim-milk. Close agreement between experimental and calculated drying curves was obtained. AS

- 2247 Kalab (M), Carlc (M), Zaher (M) and Harwalkar (VR). Composition and some properties of spray-dried retentates obtained by the ultrafiltration of milk. *Food Microstructure* 8(2); 1989; 225-233

Retentates containing 20, 27, and 34% total solids, obtained on commercial scale by the ultrafiltration of milk, were spray-dried on lab. scale using centrifugal atomization and single stage drying with the inlet air temp. of 220 °C and the outlet air temp. of 90 °C. The protein content in the powders was 31% to 35% compared to 24.8% protein in the control whole-milk powder. Lactose contents were markedly lower in the retentate powders (-10.6%) than in the milk powder (40.4%). Storage of the powders at 37 °C resulted in a marked increase in the 5-hydroxymethylfural contents with doubling of this content in the retentate powders and tripling in the milk powder. When viewed by scanning electron microscopy, the spray-dried retentate powder particles has smooth surfaces free from wrinkles usually seen in spray-dried milk powders. When the same products were exposed to atm. having 75%, 85% or 100% relative humidity, the retentate powders exhibited less lactose recrystallization than the milk powder. The melting temp. (T_m) (as determined by differential scanning calorimetry) of lactose present in the retentate powders was not affected by the reduced lactose content in the powders but the fusion enthalpy (ΔH_{fusion}) of lactose was reduced in the retentate powders compared to the control milk powder. AS

- 2248 Khedekar (CD), Dave (JM) and Sannabhadti (SS). Effect of feeding acidophilus milk on faecal lactobacilli and coliform counts in human volunteers. *Indian Dairyman* 42(5); 1990; 237-241

Acidophilus milk prepared by using two human strains of *Lactobacillus acidophilus* was fed to two groups of human test subjects including 6 healthy adults and one suffering from gastro-intestinal discomforts in each of the group. It is seen that the feeding of acidophilus milk beverage resulted in an increase in lactobacilli and decrease in

coliform counts in the faeces of all the volunteers, extent of increase in *Lactobacillus* count and decrease in coliform count in the faeces of all the volunteers varied with individuals. From the view point of the implantation ability of the cultures, vaginal isolate of *L. acidophilus* LBKV₃ seems to be superior to gastro-intestinal isolate LBK1₄. SRA

- 2249 Khedkar (CD), Dave (JM), Sannabhadti (SS) and Megha (RV). Use of acidophilus milk in treatment in human gastro-intestinal disorders. *Indian Dairyman* 42(5); 1990; 233-236

A fermented milk containing approx. 2×10^7 live cells of human strain of *Lactobacillus acidophilus* LBKV₃ per ml. was administered to eleven patients with complaints of gastro-intestinal discomforts, to varify their curative properties. Three patients suffering from chronic constipation and one patient with constipation having other ailments were fed with *L. acidophilus* treated milk for 3, 6 and 9 days. The patients were cured within 6 days of feeding, and complete recovery after 9 days. Five patients suffering from ulcerative complaints were treated with chemotherapeutic agents up to 5 days without notable response. They were given 200 g of acidophilus milk daily for 3, 6 and 9 days. Out of 5 patients one showed improvement in the oral ulcer after 3 days of feeding, and two showed improvement after 6 days. All the patients were clinically cured from oral and rectal ulcers and inflammation of piles after 9 days of feeding. Two patients suffering from diarrhoea one suffering from glossitis were also treated and observed that after 3 days of feeding there was an improvement and after 9 days all complaints were cured. In all cases complete cure was possible within a period of 9 days. SRA

- 2250 Kneifel (W), Abert (T) and Luf (W). Influence of preheating skimmilk on water-holding capacity of sodium salts of caseinates and coprecipitates. *Journal of Food Science* 55(3); 1990; 879-880

The effect of different preheat treatments of milk on the water-holding capacity of the corresponding sodium caseinates made under lab. conditions was investigated. Unheated skimmed milk, and milks heated under conditions ranging from 60 to 120 °C for 1 min, resp. were used for the manufacture of the caseinates. Water holding capacity was estimated using a method involving equilibration of the powder with excess water and measurement of the vol. of released water. Water holding progressively increased with heating, whereby with 120 °C/1 min more than two-third of the dispersion vol. tested was retained. The whey protein

content of the caseinates also varied according to temp. and water-holding capacity. AS

- 2251 Larsen (RF) and Anon (MC). Effect of water activity of milk upon growth and acid production by mixed culture of *Streptococcus thermophilus* and *Lactobacillus bulgaricus*. *Journal of Food Science* 55(3); 1990; 708-710, 800

Acid production and growth rates were determined in pure cultures of *Streptococcus thermophilus* and *Lactobacillus bulgaricus*, and cocci/bacilli ratio in mixed cultures of both sp., using milk with modified water activity as culture medium. Maximal growth rates were always at water activity lower than 0.992 for all strains when water activity of milk was adjusted with glycerol, while maximal acid production rates were at water activity 0.992-0.983. Glucose had an inhibitory effect additional to that caused by lowering water activity. The cocci/bacilli ratio in mixed cultures increased as water activity decreased in most cases, because of the higher susceptibility of *L. bulgaricus* to water activity decrease. The behaviour of a mixed culture could not always be predicted from data of the component strains in a pure culture, showing some kind of symbiotic compatibility between sp. AS

- 2252 Long (AR), Hseih (LC), Bello (AC), Malbrough (MS), Short (CR) and Barker (SA). Method for the isolation and liquid chromatographic determination of chloramphenicol in milk. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 427-429

- 2253 Long (AR), Hsieh (LC), Malbrough (MS), Short (CR) and Barker (SA). Method for the isolation and liquid chromatographic determination of furazolidone in milk. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 430-432

- 2254 Perdigon (G), Nade De Macias (ME), Alvarez (S), Oliver (G) and Pesce De Ruiz Holgado (AA). Prevention of gastrointestinal infection using immunobiological methods with milk fermented with *Lactobacillus casei* and *Lactobacillus acidophilus*. *Journal of Dairy Research* 57(2); 1990; 255-264

The protective effect of feeding milk fermented with a mixture of *Lactobacillus casei* sp. and *L. acidophilus* sp. against *Salmonella typhimurium* infection in mice was compared with that obtained feeding milks fermented with these microorganisms individually. The survival rate obtained after oral infection with *Sal. typhimurium* was 100% in mice pretreated by feeding during 8 days with the mixture

of *L. casei* and *L. acidophilus* fermented milks. Similar treatments with the individual milks were ineffective. Moreover, mice became more susceptible to infection with *Sal. typhimurium* after such treatment. The colonization of liver and spleen with the pathogen was markedly inhibited by the pretreatment with the mixture of fermented milk, while such inhibition was not observed using the *L. casei* and *L. acidophilus* milks. The highest levels of anti-salmonellae antibodies in serum and in intestinal fluid were found in the group of mice fed with the mixture and with *L. casei* fermented milk resp. However, this latter milk was not effective in protecting against *Sal. typhimurium*. When the mice were first infected with *Sal. typhimurium* and then fed with the mixture of fermented milks, pathogen colonization was not prevented. The results suggest that the augmentation of resistance to salmonellae caused by the treatment with *L. casei*- + *L. acidophilus* fermented milk was due to the anti-salmonellae protective immunity mainly mediated by the mucosal tissue. Milk fermented with this mixture could be used as an immunobiological method to prevent gastrointestinal infection. AS

- 2255 Prasad (C) and Prasad (S). Textural changes and their assessment in concentrated/evaporated milk during manufacturing and storage. *Indian Dairyman* 42(6); 1990; 274-277

A brief review on gelation in concentrated/evaporated milk; electrophoretic studies done on the effect of heat on gelation of milk proteins and also on their gel-filtration pattern. 22 references. SRA

- 2256 Reinheimer (JA) and Demkow (MR). Comparison of rapid tests for assessing UHT milk sterility. *Journal of Dairy Research* 57(2); 1990; 239-243

2 Samples₄ of UHT milk were contaminated at two levels (10^2 and 10^4 cfu//mol) with 52 bacterial strains (spoilage bacteria) of *Bacillus* spp., *B. licheniformis*, *Staphylococcus* spp., *Corynebacterium* spp., *Micrococcus* spp., *Flavobacterium* spp., *Pseudomonas putida*, *Ps. fluorescens*, *Ps. alcaligenes*, *Ps. pseudoalcaligenes*, *Pseudomonas* spp., *Enterobacter* spp., *Citrobacter* spp., *Serratia* spp. and *Proteus* sp. Samples were assayed for colony count, titratable acidity, pH modification, organoleptic assessment, stability towards ethanol (68, 80 and 88% v/v), resazuria and nitrate reduction to determine efficiency in detecting non-sterility after an incubation period shorter than that advised in standard procedures. After 3 day incubation at 30 C every case was detected by the resazuria test with a good statistical probability ($P = 0.999$). Reliability was not so

high in all other tests, even after 14 day incubation. MCV

- 2257 xen (TJ), Toledo (RT) and Frank (JF). Kinetic parameters for thermal inactivation of plasmin. *Journal of Food Biochemistry* 13(6); 1989; 475-483

Plasmin (EC 3.4.21.7) is the principal indigenous protease in bovine milk. Kinetic parameters for thermal degradation of plasmin were determined using a miniature continuous flow pasteurizer designed for heat treatment of small quantities of liquid. Plasmin activity was measured using a pH-stat titration, which measures the release of H^+ from a caseinate substrate. Heating milk at various temp. resulted in significant difference ($P < 0.01$) in residual plasmin activity and linear decrease in activity at each temp. The calculated D-values were: 105, 90, 76.5, 62, and 47 s at 72, 78, 85, 92, and 100 C, resp. The Z-value for plasmin inactivation was estimated to be 77.5 C, and the Arrhenius activation energy was 7.04 kcal/mole. UHT milk containing plasmin was heated for an equivalent of 5 D inactivation of the enzyme at 100 C. After storage for 30 days at 4 C, no enzyme regeneration was observed. AS

- 2258 Satyanarayana (S) and Das (H). Detection of residual hydrogen peroxide in package material used for aseptic packaging of milk. *Indian Dairymen* 42(5); 1990; 223-224

By titrametric method it was observed that the presence of 1 part of hydrogen peroxide in 22.7 million parts of water could be detected. When this method was adopted for milk the presence of only 1 part of hydrogen peroxide in 2262 parts of milk could be detected. This was probably due to the decomposition of hydrogen peroxide by some enzymes and other chemicals present in milk. The titrametric method cannot, therefore, be adopted directly for milk but it can be used by packing distilled water instead of milk under aseptic condition and measuring the quantity of hydrogen peroxide present in water. AS

- 2259 Sharma (DK) and Prasad (DN). Changes in the physical properties of ultra high temperature processed buffalo milk during storage. *Journal of Dairy Research* 57(2); 1990; 187-196

Buffalo milk collected within 4 h of milking was standardised (4.5% fat and 8.5% SNF) and processed in an ultra high temp. plant at 5 C intervals. Changes in viscosity, free tyrosine and processing for the UHT milks, the higher sedimentation were measured over 6 months at 15 and 30 C. Viscosities increased with the temp. of processing for the UHT milks, the higher the temp. of

processing, the higher the viscosity immediately after processing and vice versa. Proteolysis, measured as free tyrosine (mg/ml), increased with increase in the processing temp. During initial storage of the UHT milks, free tyrosine values were higher on storage at 30 C than at 15 C. Increase in the processing temp. increased the amount of sediment. Greater sedimentation occurred in milks stored at 15 C than at 30 C. An interaction probably occurred in the casein and whey proteins (beta-lactoglobulin) and caused changes in the physical and chem. qualities of these milks during storage. Variations in the casein particle sizes were observed in the milks during storage by electron microscopy. MCV

- 2260 Singh (RS) and Harish Chandra. Detection, identification and control of *L. monocytogenes* in milk and milk products. *Indian Dairyman* 42(5); 1990; 243-247

A general review covering aspects like enrichment technique for multiplication of *Listeria* spp., isolation and rapid identification; safety precautions in isolation and identification, and the common places of inhabitation and control measures. 7 references. KAR

Milk products

- 2261 Akita (EM) and Nakai (S). Lipophilization of beta-lactoglobulin. Effect on allergenicity and digestibility. *Journal of Food Science* 55(3); 1990; 718-723

Beta-lactoglobulin was chemically modified by covalent attachment of different levels of stearic acid and the effect on allergenicity and digestibility of the protein was evaluated. A decreased *in vitro* digestibility was observed with extent of lipophilization (stearic acid incorporation). Increased ability to elicit immunoglobulin E (IgE) antibodies, determined by heterologous passive cutaneous anaphylaxis, was observed at low lipophilization (attachment of fatty acid). Medium level of lipophilization decreased this ability and at high lipophilization the ability to elicit IgE antibodies and was almost destroyed. Low and medium lipophilization increased immunoglobulin G (IgG) binding ability as measured by enzyme-linked immunosorbent assay. High lipophilization decreased the IgG binding ability. AS

- 2262 Kulkarni (PR) and Pimple (NV). Drying of buffalo colostrum. *Indian Dairyman* 42(5); 1990; 231-232

Converting colostrum into powder by sun-drying or spray drying for preparing Kharwas (sweet dessert gel of

colostrum) was investigated. Sun-drying was done at 36 C when drying was complete in 4 h. Spray drying was done at 180 C inlet temp. and outlet temp. of 100 C. Dried colostrum powders were analysed for colour, flavour, taste, moisture, protein fat, ash-content and solubility. Sun-dried product had 96.4% solubility and no damage was observed to the gelling property compared to the original colostrum. Spray dried colostrum had 95.99% solubility and the gel strength of the reconstituted product was 3.67 kg compared to 3.88 kg for the original colostrum. Spray dried product was more attractive than sun-dried and had 6 months shelf life when packed in 200 g HDPE bag and stored in air tight tin containers at 30 plus or minus 2 C. The spray dried product along with sugar and flavour could be used for preparing Kharwas mix. KAR

Butter

- 2263 Halpin-Dohnalek (MI) and Marth (EH). Fate of *Staphylococcus aureus* in whipped butter. *Journal of Food Protection* 52(12); 1989; 863-866

This study determined growth and survival of *Staphylococcus aureus* strains 100-A, 196-E, 254, 473, 505, and 521 in whipped butter made by whipping butter produced from inoculated cream or in whipped butter inoculated after manufacture. Cream was inoculated to contain Ca. 10^4 to 10^5 *S. aureus*/ml and then was held at 4 C for 31 days, at 22 C for 36 h, or at 37 C for 24 h. After incubation, cream was churned to obtain butter which then was either lightly salted (1.0% w/w) or left unsalted. Fresh sweet cream also was churned to obtain sweet cream butter which was lightly salted or left unsalted. Sweet cream butter was inoculated to contain Ca. 10^5 *S. aureus*/g. Butter containing *S. aureus* was brought to 15 C and whipped for 5-7 min with a three-speed hand mixer. Whipped butter was held at 4, 10, 15, and 25 C for up to 6 wks. Whipping of butter influenced growth and survival of all strains of *S. aureus*. Whipped butter inoculated after churning and before whipping was a better medium for growth of the pathogen than was whipped butter made from butter that had been churned from inoculated cream. Whipping of butter had a greater effect than salt on the ability of *S. aureus* to grow or survive. Variability among strains also was important in determining growth and survival of *S. aureus* in whipped butter. AS

Cheese

- 2264 Marshall (RJ). Composition, structure, rheological properties, and sensory texture of processed cheese analogues. *Journal of the Science of Food and Agriculture*

50(2); 1990; 237-252

Processed cheese analogues were made with different fat and moisture in non-fat solids (MNFS) contents and used to study relationships between comp., microscopic structure, rheological properties and sensory texture. Fat contents ranged from 58 to 230 kg⁻¹ and MNFS from 487.6 to 603.3 kg⁻¹. Regressions showed that those rheological parameters measured by uniaxial compression at large deformation and moderately high rates were best explained by linear combinations of MNFS, protein and fat. The moisture in the protein network acted as a plasticiser lowering the rheological parameters. Fat alone had little direct effect on the rheological characteristics under these conditions but at small deformation and low deformation rates it formed elastic inclusions that contributed to the properties. Examination of fracture surfaces in the SEM suggested that, during fracture, fat was squeezed out and acted as a lubricant. Max. stress and work to max. stress measured at moderately high deformation rates related best to the sensory results and described fracture of the cheese. From the regressions, for 95% confidence limits, sensory analysis could theoretically measure changes within the range of comp. tested of < 0.1% in MNFS or fat. Of the rheological parameters only work to max. stress was as sensitive. However, interaction between these compositional factors reduced the sensitivity in practice. AS

- 2265 Modler (HW), Yiu (SH), Bollinger (UK) and Kalab (W). Grittiness in a pasteurized cheese spread. A microscopic study. *Food Microstructure* 8(2); 1989; 201-210

Cheese-wheys

- 2266 del Pilar Buera (M), Chirife (J) and Resnik (SL). Non-enzymatic non-oxidative browning in hydrolyzed shelf-stable concentrated cheese-whey. *Journal of Food Science* 55(3); 1990; 697-700

The rate of brown colour development in hydrolyzed concentrated cheese-whey (HCCW), and in model systems of related comp., was studied. Degree of lactose hydrolysis was a relevant parameter controlling rate of colour changes, both in modified whey or in related model systems. Added CaCl had a strong inhibitory effect on caramelization browning in model system in which no amino compounds were added. This inhibitory effect was less important in model systems containing whey proteins and in HCCW in which Maillard's browning is the main mechanism of darkening. Effects of pH and temp. were similar to that previously reported for non-hydrolyzed concentrated cheese-whey, as

well as for many model systems containing sugars and amino acids. AS

Ice cream

- 2267 Goff (HD), McCurdy (RD) and Gullett (EA). Replacement of carbon-refined corn syrups with ion exchanged corn syrups in ice cream formulations. *Journal of Food Science* 55(3); 1990; 827-829, 840

Ice cream was manufactured utilizing ten corn syrups at 5% (dry basis) in the mix, 30 DE, 42 DE high maltose (HM), 55 DE HM and 64 DE, each of which was processed through the carbon-refined and ion-exchanged processes. An increase in DE of the syrup led to a decrease in mix viscosity, a decrease in the freezing point of the mix, a decrease in fat destabilization and a decrease in firmness of the ice cream. The ion-exchanged syrups decreased the mix viscosity and produced a drier ice cream with greater fat destabilization but had no influence on mix freezing point depression, overrun firmness or meltdown. Sensory results from the 42DE HM and 55DE HM carbon refined and ion-exchanged products evaluated in this study showed no difference in sweetness or texture. The flavour and acceptability of 42DE HM carbon-refined syrup in ice cream was preferred less than the 42 DE HM or 55DE HM ion-exchange syrups. AS

- 2268 Hitchins (AD). Quantitative comparisons of two enrichment methods for isolating *Listeria monocytogenes* from inoculated ice cream. *Journal of Food Protection* 52(12); 1989; 898-900

Two enrichment methods for isolating *Listeria monocytogenes* (the Lovett method, formerly used by the U.S. Food and Drug Administration, and the revised method for the U.S. Department of Agriculture) were compared using 25 g test portions of spiked vanilla ice cream. Both methods were found to be equally sensitive. Prolonging the enrichments to 7 days and the use of alkali pretreatment had no significant effect on the results. Reduction of the test portion size from 25 to 1 g in the revised USDA method decreased the level of sensitivity by an order of magnitude, as expected. AS

- 2269 Martinou-Voulasiki (IS) and Zerfiridis (GK). Effect of some stabilizers on textural and sensory characteristics of yoghurt ice cream from sheep's milk. *Journal of Food Science* 55(3); 1990; 703-707

Yoghurt ice cream made of 6.5% sheep's milk fat and 11.5% of non-fat milk solids (MSNF) derived by 83% from sheeps milk contained decreased lactose and increased

protein by approx. 20% and 25%, resp. compared to the conventional product from cow's milk. Acidity of the final product was from pH 4.4 to 4.9. Stabilizers that were tried were xanthan gum, guar gum and a commercial stabilizer at concn. 0.0, 0.1, 0.2, 0.3, 0.4, and 0.5%. Based on detn. of physical qualities as well as on the sensory evaluation of the yoghurt ice cream, xanthan gum gave optimum results at 0.2% concn., guar gum at 0.3% while the commercial stabilizer was partially satisfactory up to 0.5% concn. AS

Kheer

- 2270 Bhupendar Singh, Mahadevaiah (B), Balasubrahmanyam (N) and Shurpalekar (SR). Studies on ready-mix for kheer. Packaging and storage in flexible pouches. *Journal of Food Science and Technology (India)* 27(2); 1990; 73-75

Sorption studies carried out at relative humidities (RH) ranging from 11 to 86% on kheer ready mixes based on 30% roasted wheat semolina (Bansi or white soji), 30% powdered sugar and 40% whole milk powder, indicated that an equilibrium moisture content (EMC) of 57.58% at 44% RH was critical, beyond which soggy and lump formation were observed. The ready-mixes, when packed in polypropylene (200 gauge) and metallized polyester/poly pouches, kept well for (i) 120 and 150 days resp. at 65% RH and 27 C, and (ii) 46 days at 92% RH and 38 C. AS

Khoa

- ✓ 2271 Christie (IS) and Shah (US). Development of khoa-making machine. *Indian Dairyman* 42(5); 1990; 249-252

A sketch of a khoa-making machine has been given with description of the heat exchanger, and the performance of the machine. The machine could convert 50 kg of milk into khoa per h per batch and the khoa produced had good acceptability. KAR

Milk powder

- 2272 Sarmah (BN), Joginder Singh and Goyal (GK). Effect of atmospheric and vacuum roller drying systems on the physical and chemical characteristics of buffalo skim milk powder. *Journal of Food Science and Technology (India)* 27(2); 1990; 93-96

The skim milk powder prepared by atmospheric roller drying system showed higher sinkability, more wettability time, lower solubility, bulk density (both loose and packed) and dispersibility. The particle size of vacuum roller

dried powder was smaller and more uniform and the colour of atmospheric roller dried powder was more brownish than that of vacuum roller dried milk powder. The moisture content was observed to be comparatively more in vacuum roller dried samples. 5-hydroxymethyl furfural (HMF) values were found to be almost 7 times higher for atmospheric roller dried samples than vacuum roller dried powders. AS

Wheys

- 2273 Ontomo (H), Hamamatsu (K), Hori (E) and Kuwata (T). Studies on the elimination of beta-lactoglobulin from whey using carboxymethyl cellulose cation exchanger. Effects of pH and desalting of whey on the fractionation of beta-lactoglobulin. *Journal of the Japanese Society of Starch Science* 35(11); 1988; 775-762 (Ja).

The effects of pH and desalting on the elimination of beta-lactoglobulin (beta-LG) from bovine whey by using carboxymethyl cellulose (CMC) cation exchanger were investigated. Desalting of whey enhanced the amount of adsorbed beta-LG on CMC cation exchanger. However, excess desalting, i.e. more than 90% as conductivity, reduced the selective adsorption of beta-LG to CMC cation exchanger. Selective adsorption of beta-LG on CMC cation exchanger could be performed at pH 4.6 in the case of using the wheys which was dialysed for 48 h. If the pH of whey was lower than 4.0, not only beta-LG but also other proteins, for example, alpha-lactalbumin (alpha-LA), bovine serum albumin (BSA) and immunoglobulin (Igs), were adsorbed on CMC cation exchanger. On the other hand, if the pH was higher than 5.0, major whey proteins containing beta-LG could not be adsorbed on CMC cation exchanger. Two types of freeze-dried whey protein fractions could be obtained. One is beta-LG eliminated whey powder which showed good solubility and heat stability, and the other is beta-LG rich whey protein isolate. beta-LG accounted for less than 20% of major proteins in the beta-LG eliminated fraction, while more than 90% of major proteins in the beta-LG rich fraction. AS

Whey proteins

- 2274 Rector (DJ), Kella (NK) and Kinsella (JE). Reversible gelation of whey proteins. Melting, thermodynamics and viscoelastic behaviour. *Journal of Texture Studies* 20(4); 1990; 457-471

Whey protein isolates formed reversible gels following heating at 90 °C for 15 min under certain conditions i.e. pH 6.5 to 8.5 with protein concn. of 9.0-10.5%. The melting temp. of the gels formed at pH 8.0 ranged from 24.5 °C to

57.8 C. The max. enthalpy of formation (ΔH_f) was -858 cal/mole₂ of crosslinks. A max. storage modulus (G') of 240 dynes/Cm² was obtained following holding for 7 h at 8 C. AS

Milk proteins

- 2275 Akita (EM) and Nakai (S). Lipophilization of beta-lactoglobulin. Effect of hydrophobicity, conformation and surface functional properties. *Journal of Food Science* 55(3); 1990; 711-717

Beta-lactoglobulin was chemically modified by attaching different levels of stearic acid, and the effect on hydrophobicity, emulsifying and foaming properties was investigated. Incorporation of the hydrophobic ligands led to increased hydrophobic interactions, resulting in a decreasing solubility with extent of incorporation. Surface hydrophobicity measurements showed that the two fluorescence probes 8-anilidonaphthalene-1-sulphonate (ANS) and cis-parinaric acid (CPA) used were not equivalent. Some improvement of emulsifying and foaming properties was observed at low and medium levels of incorporation which decreased as the extent of fatty acid attachment further increased. High solubility and ANS surface hydrophobicity were both needed for the best emulsifying properties. AS

Caseins

- 2276 Chobert (J-M), Touati (A), Bertrand-Harb (C), Dalgalarrrondo (M) and Nicolas (MG). Solubility and emulsifying properties of Kappa-casein and its caseino-macropeptide. *Journal of Food Biochemistry* 13(6); 1989; 457-473

Kappa-casein A was treated with chymosin in order to isolate the caseino-macropeptide corresponding to the C-terminal 106-109 residues of k-casein. Whole casein, K-casein and the caseino-macropeptide (CMP) were studied for their water solubility and emulsifying activity. The CMP was soluble over the range of pH from 1 to 10, with a "minimum" solubility (88%) in the range of pH 1-5 and a "maximum" solubility (98%) in the range of pH 5-10. For whole casein and k-casein, at pH values above 5.5, the emulsifying activity increased when pH increased and the max. value was obtained for very alkaline solutions; for pH values below 4.5, the increase in emulsifying activity was much more pronounced at pH 2.5; below pH 2.5, emulsifying activity decreased. For CMP, the increase in emulsifying activity was much more pronounced in the acidic range than in the alkaline range. After 24 h storage and heating of the emulsion, a large pH-dependant decrease of emulsifying

activity (22-60%) was observed for CMP for pH values below 4.0; under the same conditions, the emulsifying activity of whole casein and k-casein showed a 5-19% and a 1-21% decrease, resp. For pH values above 6.0, a 22-59% decrease was observed for CMP as compared to a 1-12% and a 4-17% decrease with whole casein and k-casein, resp. AS

- 2277 Fichtali (J), Van de Voort (FR) and Khuri (AI). Multiresponses optimization of acid casein production. *Journal of Food Process Engineering* 12(4); 1990; 247-258

A multivariate skimmilk extrusion process, designed to produce an acid co-precipitate was studied in terms of minimizing residual lactose, ash and fines. An experimental model system was utilized to simulate the extrusion process and evaluated using response surface methodology to assess the relationship between the responses (fines, residual lactose and minerals) and the process variables (concn. pH, temp., agitation, washing time and wash water ratio). Compromise optimum conditions were derived using the Generalized Distance Approach (GDA) and an Extended Response Surface Procedure (ERSP) which made use of the SAS RSREG procedure with and without constraints. The GDA procedure produced good results in terms of providing an optimum for a general acid casein process, while the ERSP allowed more extensive analysis of the data in terms of assessing specific processing conditions. Although more computing intensive, the ERSP conferred additional flexibility in determining optimal conditions for special situations such as extrusion processing. Both approaches are useful for process engineering, with the GDA being a more general tool while the ERSP is advantageous when the GDA procedure becomes limiting. AS

- 2278 Harwalkar (VR), Allan-Wojtas (P) and Kalab (M). Effect of heating to 200 C on casein micelles in milk. A metal shadowing and negative staining electron microscope study. *Food Microstructure* 8(2); 1989; 217-224

Milk was heated to 200 C for 3 min in sealed inverted-Y-shaped glass vials and reacted with a glutaraldehyde solution at that temp. Electron microscopy of the metal-shadowed and negatively stained samples revealed that casein micelles in the milk did not disintegrate extensively at the high-temp. used but, rather, became enlarged. Some of them were found to be either clustered or distorted. AS

- 2279 Le Meste (M), Viguier (L), Lorient (D) and Simatos (D). Rotational diffusivity of solutes in concentrated caseinates. Influence of glycosylation. *Journal of Food Science* 55(3); 1990; 724-727

Numerous factors control the diffusion of small molecules in concentrated polymeric systems. The aim of the present work was to study the influence of an internal plasticization treatment (glycosylation) of a protein (caseinate) on the rotational diffusivity of nitroxide radicals as a function of hydration. Rotational diffusivity was measured using Electron Spin Resonance. High levels of glycosylation improved the protein flexibility, and, above a given level of mobility, this higher flexibility was accompanied by an increased rotational diffusivity of the small solutes. Water acts as plasticizer by increasing the free vol. of the system and as a solvent by dispersing the mol. AS

- 2280 Sanogo (T), Paquet (D), Aubert (F) and Linden (G). Proteolysis of α casein by papain in a complex environment. Influence of ionic strength on the reaction products. *Journal of Food Science* 55(3); 1990; 796-800

The influence of NaCl on bovine α casein (α -CN) hydrolysis by papain (EC 3.4. 22.2) was studied at pH 6.5 and 40 C. The electrophoretic analysis in presence of sodium dodecyl sulphate (SDS), showed that α -CN was sequentially hydrolyzed as the reaction time increased. The analysis by isoelectric focusing electrophoresis showed that after 1 min, the resulting peptides had their isoelectric point (PI) assessed between 4 and 9. With the increase of NaCl concn., two peptides of apparent pI near pH 5 and 8.5 were progressively liberated. The chromatographic analysis by reverse phase HPLC showed that a major peak, observed after 1 min of reaction, persisted in the hydrolysates obtained in the presence of salt at all reaction times. It was concluded by the peptide sequence detn. that the hydrophobic C-terminal region of α was not hydrolyzed in the presence of NaCl. AS

- 2281 Sanogo (T), Paquet (D) and Linden (G). Proteolysis of α casein by papain in a complex environment. Influence of ionic strength on the kinetic constants. *Journal of Food Science* 55(3); 1990; 801-804, 816

The influence of α -casein concn. on the hydrolysis activity of papain was studied. High substrate concn. was inhibitory. In presence of NaCl, the papain affinity of α -casein increased (the apparent Michaelis constant (K_m app.) decreased from $9.4 \cdot 10^{-5}$ to $5.6 \cdot 10^{-5}$ M) and was lower for 0.08 M NaCl. The max. velocity (V_{max} app.) was independent from NaCl concn. below 0.34 M but decreased above. The enzyme-substrate affinity was increased by the addition of urea, but the V_{max} app. decreased. The

inhibitory effect of excess substrate was more important with the presence of both urea and NaCl. Acetylation of α -casein showed that K_m app. (21.2×10^{-5} M) was independent of salt concn., while the V_{max} app. varied, and the substrate inhibitory activity was suppressed. AS

MEAT AND POULTRY

Meat

- 2282 Gordon (A) and Barbut (S). The effect of chloride salts on the texture, microstructure and stability of meat batters. *Food Microstructure* 8(2); 1989; 271-283

The stability, texture and microstructure of six mechanically deboned chicken meat batters prepared with NaCl (1.25 and 2.5%) and replacement of the 2.5% NaCl with MgCl, CaCl, KCl and LiCl based on isoionic strength were examined. The uncooked MgCl batter showed the poorest fat binding. The monovalent chloride salts produced stable cooked batters, whereas both divalent salts did not. CaCl produced a more unstable batter than MgCl. High correlation was found between water and fat loss and total cookout losses from cooked batters. Texture was significantly affected by the type of chloride salt used. The divalent chloride salt batters had low brittleness and were similar in texture. They had a different texture profile from monovalent chloride salt batters. Hardness and springiness were found to be related to batter stability. Microstructural differences between treatments and reflected differences in batter stability and appeared to explain some of the textural differences. The protein matrices of the monovalent chloride salt batters were all similar. However, LiCl produced a more tightly interwoven matrix than the others. Extensive coalescence was evident in the batters made with MgCl, and CaCl which resulted in the formation of fat channels. In addition, their protein matrices were highly aggregated. Batter stability and texture appear to depend on the structure and integrity of the matrix as well as the formation of a stable protein film around fat globules. AS

- 2283 Puttarajappa (P), Nair (KKS) and Kadkol (SB). Development of meat preserve. *Journal of Food Science and Technology (India)* 27(2); 1990; 102-103

A new meat product, 'Meat Preserve' with optimum salt concn. low pH and low moisture level, which can be stored at ambient temp. (25-30 C) was developed. The desired

moisture level in meat (38-40%) could be obtained by frying pork slices of one inch cube, in oil hydro between 150-160 C, for about 30 min. Salt content of 6-8% and pH of 3.8-4.0, were obtained by equilibrating the fried pork cubes with acidulated brine solutions containing 25% salt in 5% acetic acid. 'Meat Preserve' obtained by mixing the treated pork cubes with a gravy containing spices, was found microbially safe, and had acceptable taste and flavour upto 6 months of storage, at ambient temp. AS

- 2284 Sawaya (WN), Saeed (T), Mameesh (M), El-Rayes (E), Hussain (A), Ali (S) and Abdul Rahman (H). Detection of pork in processed meat. Experimental comparison of methodology. *Food Chemistry* 37(3); 1990; 201-219
- 2285 Valdes (EV), Atkinson (JL), Hilton (JW) and Leeson (S). Near infrared reflectance analysis of fat, protein and gross energy of chicken and rainbow trout carcasses. *Canadian Journal of Animal Science* 69(4); 1989; 1087-1090

Separate calibrations for fish and chicken carcasses were developed to predict chem. comp. (per cent crude protein and fat) and gross energy (GE) by near infrared reflectance analysis (NIRA). Per cent crude protein (CP), per cent fat and kJ g^{-1} of GE in the fish samples were predicted with standard error of the estimate (SEE) of 1.8, 1.4 and 1.7 resp. The SEE values for the prediction of CP, per cent fat and kJ g^{-1} of GE in chicken carcasses were 1.7, 2 and 0.54 resp. AS

Beef

- 2286 Cooksey (K), Klein (BP) and McKeith (FK). Thiamin retention and other characteristics of cooked beef loin roasts. *Journal of Food Science* 55(3); 1990; 863-864
- 2287 Dickson (JS). Comparison of homogenization by blending or stomaching on the recovery of *Listeria monocytogenes* from beef tissues. *Journal of Food Science* 55(3); 1990; 655-657
- 2288 Xedina (MB). Selective inhibition of lectin induced rabbit erythrocyte agglutination by hydrolysates of skeletal beef protein. *Journal of Food Science* 55(3); 1990; 867-868, 884
- 2289 Murray (AC). Factors affecting beef colour at time of grading. *Canadian Journal of Animal Science* 69(2); 1989; 347-355
- 2290 Noble (JM), McMahon (PS), Seman (DL), Moody (WG) and Douglass (LW). Effect of institutional heating methods of cold and hot boned restructured beef roasts. *Journal of Food*

Science 55(3); 1990; 658-660, 773

- 2291 Van Laack (RLJM), Eikelenboom (G) and Smulders (FJM). Colour stability of hot and cold boned Longissimus and Psoas major muscle. *Journal of Food Protection* 52(12); 1989; 894-897
- 2292 Vazquez-Moreno (L), Bermudez (MC), Langure (AA), Higuera-Ciapar (I), Diaz de Aguayo (M) and Flores (E). Antibiotic residues and drug resistant bacteria in beef and chicken tissues. *Journal of Food Science* 55(3); 1990; 632-634, 657

Beef steaks

- 2293 Crouse (JD) and Koohmarale (M). Effect of post-cooking storage conditions on shear-force values of beef steaks. *Journal of Food Science* 55(3); 1990; 858, 860
- 2294 Whiting (RC) and Strange (ED). Effects of lactic acid on epimysial connective tissues of muscles used for restructured beef steaks. *Journal of Food Science* 55(3); 1990; 859-860

Chevon

- 2295 Lamikanra (VT) and Dupuy (HP). Analysis of volatiles related to warmed over flavour of cooked chevon. *Journal of Food Science* 55(3); 1990; 861-862

Mutton

Sheep

Lambs

- 2296 Paul (P), Venugopal (V) and Nair (PM). Shelf-life enhancement of lamb meat under refrigeration of gamma irradiation. *Journal of Food Science* 55(3); 1990; 865-866

Influence of low dose gamma-irradiation on the storage stability of fresh lamb meat (prepacked chunks and mince) at 0-3 C was examined by sensory, microbiological and chemical criteria. The meat chunks irradiated at 1.0 kGy and 2.5 kGy remained in acceptable conditions for 3 and 5 wks resp., whereas the corresponding shelf life for irradiated (1.0 kGy and 2.5 kGy) mince were 2 and 4 wks resp. In contrast, unirradiated meat chunks and mince spoiled within one wk of storage at 0.-3 C. AS

Pork

- 2297 Ahmed (PO), Miller (MF), Lyon (CE), Vaughters (HM) and

Reagan (JO). Physical and sensory characteristics of low-fat fresh pork sausage processed with various levels of added water. *Journal of Food Science* 55(3); 1990; 625-628

- 2298 Boles (JA) and Parrish (FCJr). Sensory and chemical characteristics of precooked microwave-reheatable pork roasts. *Journal of Food Science* 55(3); 1990; 618-620
- 2299 Gill (CO) and Harrison (JCL). The storage life of chilled pork packaged under carbon dioxide. *Meat Science* 26(4); 1989; 313-324
- 2300 Heymann (H), Hedrick (HB), Karrasch (MA), Eggeman (MK) and Ellersieck (MR). Sensory and chemical characteristics of fresh pork roasts cooked to different endpoint temperatures. *Journal of Food Science* 55(3); 1990; 613-617
- 2301 Long (AR), Hsieh (LC), Malbrough (MS), Short (CR) and Barker (SA). Multiresidue method for the determination of sulphonamides in pork tissue. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 423-436
- 2302 Madden (RH). Extending the shelf-life of vacuum-packaged pork liver pate. *Journal of Food Protection* 52(12); 1989; 881-885
- 2303 Palombo (R) and Wijngaards (G). Predictive model for the lightness of comminuted porcine lean meat during heating. *Journal of Food Science* 55(3); 1990; 601-603, 612
- 2304 Palombo (R) and Wijngaards (G). Kinetic analysis of the effect of some processing factors on changes in colour of comminuted meats during processing. *Journal of Food Science* 55(3); 1990; 604-612

Products

- 2305 Nuckles (RO), Smith (DM) and Merkel (RA). Meat by-product protein composition and functional properties in model systems. *Journal of Food Science* 55(3); 1990; 640-643, 682

Comp. and functional properties of selected meat by-products were studied. Mechanically deboned chicken meat (MDCM) and meat by-products (pork lung lobes, pork liver, beef lung lobes, beef spleen, beef heart) varied in their proximate comp amount of the three major protein fractions (low ionic strength soluble (LIS), high ionic strength soluble (HIS), insoluble) and collagen content. Cooked batter model system reheat yield was positively correlated with the quantity of HIS protein and the percentage myosin and actin in this HIS protein fraction. Stress and strain

at failure of the cooked batters were inversely correlated to the amount of LIS proteins and positively correlated with the percentage of myosin and actin in the by-products. AS

Meat

- 306 Resurreccion (AVA) and Reynolds (AEJr). Evaluation of natural antioxidants in frankfurters containing chicken and pork. *Journal of Food Science* 55(3); 1990; 629-631, 654

Three natural antioxidant systems, tocopherol, extract of rosemary, a tocopherol and rosemary combination, and BHA/BHT were evaluated in frankfurters prepared from chicken and pork. Thiobarbituric acid numbers of refrigerated bulk and vacuum packaged samples stored in darkness for up to 18 days indicated that natural tocopherols provided significantly more protection than controls containing no antioxidant and were as effective as BHA/BHT in retarding oxidation. All bulk packaged frankfurters except those containing BHA/BHT and tocopherols were inedible after 18 days. Colour values indicated no evidence that any treatment provided better colour stability. AS

- 2307 Vojdani (F) and Antonio Torres (J). Potassium sorbate permeability of methylcellulose and hydroxypropyl methylcellulose coatings. Effect of fatty acids. *Journal of Food Science* 55(3); 1990; 841-846

Surface microbial stability is a major determinant of the shelf life of refrigerated meat products. Surface microbial growth has also been noticed in intermediate moisture foods exposed to temp. fluctuations. One solution to this problem is to apply edible coatings to the food surface which control diffusion of antimicrobial agents into the foods. Films with such properties were identified using a permeability cells. Methyl- and hydroxypropyl methylcellulose mixed with lauric, palmitic, stearic and arachidic acid significantly lowered the potassium sorbate permeation rate relative to cellulose ether films containing no fatty acids. Permeability detn. at 5, 24, 32 and 40 °C showed excellent agreement with the Arrhenius activation energy model for the permeation process. AS

Frankfurters

- 2308 Park (J), Rhee (KS) and Ziprin (YA). Low-fat frankfurters with elevated levels of water and oleic acid. *Journal of Food Science* 55(3); 1990; 871-872, 874

The effects of simultaneous incorporation of max. allowable levels of water and high-oleic sunflower oil

(HOSO) on frankfurter properties were investigated. The formulation changes generally had little effect on processing yield. Frankfurters formulated with HOSO were 180-241% higher in the ratio of total monounsaturated fatty acids to total saturated fatty acids when compared to control products with similar total fat levels. Consumer-panel sensory data and instrumental texture profile data indicated that low-fat (14-16%), high-water, HOSO frankfurters were as acceptable as control frankfurters with 28% fat (all-animal fat) and did not have the texture problems observed previously with low-fat, HOSO frankfurters without extra added water. AS

Poultry

2300 Ahn (DU) and Maurer (AJ). Poultry meat colour. Kinds of heme pigments and concentrations of the ligands. **Poultry Science** 69(1); 1990; 157-165

2310 Schade (JE), Tasi (L-S), Tong (L), Wilson (R) and MacGregor (JT). Extraction of mutagens from chlorinated poultry chiller water. **Journal of Food Science** 55(3); 1990; 635-639, 657

Poultry chiller water (PCW) was used as a model to study the formation of mutagens that can result from chlorinating waters of high organic content. The Ames Salmonella mutagenicity tests was used to evaluate solvent extracts of PCW. Pentane gave satisfactory extraction of mutagens without the emulsion problem encountered with dichloromethane, permitting the use of pentane in continuous extractors. Use of thiosulphate to remove residual chlorine in samples resulted in low mutagenicity. Mutagens were formed within min of chlorination and continued to change in amount during the next 1-2 h. Mutagen formation was affected by pH and was proportional to chlorine dosage. AS

Chickens

2311 Dawson (PL) Sheldon (BW), Larick (DK) and Ball (HRJr). Changes in the phospholipid and neutral-lipid fractions of mechanically deboned chicken meat due to washing, cooking and storage **Poultry Science** 69(1); 1990; 166-17

Mechanically deboned chicken meat (MDCM) was extracted by using a pilot-scale, aqueous washing regimen. The resulting raw and cooked products were evaluated at 0 time and after 4 days of refrigerated storage (at 4 C) for thiobarbituric acid values (TBA), phospholipid (PL) content, and fatty acid profiles of the PL and neutral lipid (NL) fractions. Washing removed 88.3% of the total fat from

MDCM, yet this meat had higher TBA values and oxidized to a greater extent during storage than the unwashed MDCM. This same oxidation was evident in the cooked, unwashed MDCM and cooked, washed MDCM. The PL comprised 4% of the total fat in unwashed MDCM and 24% of the total fat in washed MDCM. Phosphatidylcholine and lysophosphatidylethanolamine (PC + LPE), phosphatidylethanolamine (PE), and sphingomyelin were significantly removed by washing, oxidation, or both during extraction. Washing removed 81% of the NL fatty acids, in but only 57% of the PL fatty acids. The fatty acids of PE and PC + LPE oxidized more readily during storage than the other PL fatty acids. AS

- 2312 Heath (JL), Owens (SL), Tesch (S) and Hannah (KW). Effects of high-energy electron irradiation of chicken meat on *Salmonella* and aerobic plate count. *Poultry Science* 69(1); 1990; 150-156

Four exp. were used to determine the effects of high-energy irradiation on the number of aerobic microorganisms and *Salmonella* on broiler breasts and thighs. Irradiation ranging from 100 to 700 kilorads (krads) was provided by a commercial-scale, electron-beam accelerator. Irradiation of broiler breast and thigh pieces with electron beams at levels of 100, 200, 300, 400, 500, and 600 krads showed that levels as low as 100 krads would eliminate *Salmonella*. When 33 thighs were tested after irradiation at 200 krads, only one thigh tested presumptive positive. The total number of aerobic organisms was reduced by 2 to 3 $\log_{10}$ cycles at irradiation levels of 100, 200, 300, 400, 500, 600, and 700 krads. Increasing the dose above 100 krads gave little if any additional benefit. AS

- 2313 Pikul (J) and Kummerow (FA). Effect of total lipids, triacylglycerols and phospholipids on malonoaldehyde content in different types of chicken muscles and the corresponding skin. *Journal of Food Biochemistry* 13(6); 1989; 409-427

Total lipid extracted from chicken breast, thigh, drumstick and wing muscles and the corresponding skin was analyzed for triacylglycerols and phospholipids as well as their fatty acid comp. and also for malonaldehyde and lipid oxidation fluorescent products (LOFP) content. Muscles consist of only 1.2-3.2% lipid, but lipid concn. in the skin ranges from 22.2-31.7%. The percentage of phospholipid in muscle lipid was 20 times more than that of the skin. The fatty acids of triacylglycerols from muscles and skin contained less than 2% of polyunsaturated fatty acids (PUFA). Fatty acids from phospholipid of the meat contained over 15% arachidonic acid and substantial amounts of PUFA with 22 carbon atoms. Skin phospholipid had 10.6-13.2% of

all PUFA. Differences in the lipid comp. of muscles and skin resulted in a concn. of malonaldehyde in muscle lipids of 30-50 mg/g, a value more than 15 times greater than in lipids of the skin. However, the TBA number of the skin was the same or a little bit lower as compared to muscles. The relative levels of LOFP in the organic phase of Folch-extracted muscle and skin tissues paralleled the trend found for malonaldehyde concn. It was concluded that the simultaneous detn. of total lipid content and malonaldehyde concn. in lipid extracted from various chicken muscles and corresponding skin was the most informative method for evaluation of precursors of lipid oxidation in fresh tissue. AS

Broilers

- 2314 Ang (CYW) and Lyon (BG). Evaluations of warmed-over flavour during chill storage of cooked broiler breast, thigh and skin by chemical, instrumental and sensory methods. *Journal of Food Science* 55(3); 1990; 644-648, 673

Broiler breast, thigh and skin were cooked at 80 C stored at 2 C for up to 5 days, and evaluated by chem., gas chromatographic (GC) and sensory methods. Water and fat content of cooked meat did not change during storage. Thiobarbituric acid (TBA) values and levels of major headspace volatiles increased throughout storage time. Intensities of cardboard, warmed-over, rancid/painty, and overall off-flavour characteristics increased. Skin showed the least changes. Breast and thigh meat differed in GC profiles but were similar in sensory scores after 1 days and in TBA values after 2 days of storage. Both TBA and headspace GC measurements are associated with the off-flavour development. AS

Poultry products

Eggs

- 2315 Mano (K), Hagi (Y), Shoji (A) and Shibamoto (T). Volatile compounds formed from cooked whole egg, egg yolk, and egg white. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 461-464

Headspace samples obtained from heated whole egg, egg white and egg yolk, with use of simultaneous purging-extraction apparatus were analyzed by gas chromatography (GC) and gas chromatography/mass spectrometry (GC/MS). The volatile chemicals identified included aldehydes, ketones, alcohols, indoles, sulphides, nitriles, furans, thiazoles, thiophenes, pyridines, pyrroles, phenols, pyrazines,

benzenes, and miscellaneous compounds. A total of 141 compounds were isolated and identified: 87 from whole egg, 75 from egg yolk and 57 from egg white. Cooked whole egg contained alkylbenzenes, nitriles, and ketones as major components. Cooked egg yolk had large numbers of aldehydes and pyrazines, while the major components of cooked egg white were ketones and pyrazines. AS

SEAFOODS

- 2316 Kantha (SS). Carotenoids of edible molluscs. A review. *Journal of Food Biochemistry* 13(6); 1989; 429-442

This review focuses on the studies reported on carotenoids of edible molluscs in the 1980s. Following an introduction to edible molluscs, it covers the literature published in areas such as localization of carotenoids, source of carotenoids for molluscs, functions of carotenoids in molluscs and prospective biotechnological uses of carotenoids. AS

Carps

- 2317 Watabe (S), Hwang (G-C), Ushio (H), Hatae (K), Yamanaka (H) and Hashimoto (K). Acceleration of physicochemical changes in carp muscle by washing in either chilled or heated water. *Journal of Food Science* 55(3); 1990; 674-677, 692

"Arai" (washing) is a traditional cooking method of fish preparation in Japan. Carp muscle slices were washed in water (49 °C for 15 sec, or 0 °C for 10 min), and examined for physical and biochemical changes. At 49 °C, rigor-mortis was accelerated, resulting in a marked decrease of muscle slice thickness. ATP degradation proceeded faster at 49 °C than at 0 °C. Arai treatment at 49 °C increased myofibrillar 2Mg^{2+} - ATPase activity 8-9 times in the absence of Ca^{2+} as much, giving only a 1.2 times increase. AS

Prawns

- 2318 Chen (H-C), Moody (MW) and Jiang (S-T). Changes in biochemical and bacteriological quality of grass prawn during transportation by icing and oxygenating. *Journal of Food Science* 55(3); 1990; 670-673

Live grass prawns (*Penaeus monodon*) were iced or oxygenated in cold water and examined for changes in biochemical and bacterial quality during transportation from

the farm to the processing plant. The biochemical quality of oxygenated prawns as assessed by volatile base-nitrogen (VB-N), extractable nitrogen (AA-N), VB-N/AA-N ratio, K-value, water-holding capacity and sensory results, was superior to that of iced prawn. No distinct differences in inosine 5'-monophosphate (IMP) ratio, nucleotides profile and bacterial contamination between iced and oxygenated samples were observed. AS

Fish

- 2319 Antonacopoulos (N) and Vyncke (W). Determination of volatile basic nitrogen in fish. A third collaborative study by the West European Fish Technologists Association (WEFTA). *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(4); 1989; 309-316

Thirteen lab. participated in the third WEFTA exercise on detn. of volatile base nitrogen (TVB-N) in fish. Plaice and herring, each at 3 stages of freshness, were distributed. Eleven lab. applied the direct distillation of fish after addition of magnesium oxide (MgO) (Antona method). Six lab. carried out analysis by their own methods also, while two lab. used their own methods only. In five of these own methods, extracts with trichloroacetic or perchloric acid made alkaline with sodium hydroxide (NaOH) were distilled. The results of the 3rd exercise confirm in principle the findings of the second trial, in which participants used an extraction procedure (Codex method). Both Antona and Codex methods show similar systematic errors. The mean recoveries of TVB-N by the Antona method, related to reference values of the test materials, were 94.7 plus or minus 9.4% for plaice and 91.6 plus or minus 8.8% for herring; the mean recoveries of added ammonium sulphate were similar, 94.1% and 88.7%, resp. Supplementary tests indicated that a pH > 11 during distillation promotes secondary generation of ammonia; MgO had an advantage over NaOH in this respect. In order to reduce variations in TVB-N results, a detailed description of all steps of the method is an essential precondition for standardisation: a draft is appended. The TVB-N method is judged to be suitable as a standard method for routine quality control. Being quick and relatively inexpensive to carry out, the direct distillation procedure is preferred for large numbers of samples; extraction method permit parallel detn. of other amines, such as trimethylamine, where confirmation is required. AS

- 2320 Busconi (L), Folco (EJ), Martone (CB) and Sanchez (JJ). Postmortem changes in cytoskeletal elements of fish muscle. *Journal of Food Biochemistry* 13(6); 1989; 443-451

Transmission electron microscopic examination of samples from fresh and 7 days-cold-stored white croaker skeletal muscle did not reveal apparent changes in overall structure of contractile elements of muscle. However, when purified myofibrils obtained from fresh and stored muscles were extracted with 0.6 M KI and the residues were examined in the scanning electron microscope, a progressive disappearance of exosarcomeric longitudinal filaments connecting successive Z structures was observed. Electrophoretic analysis of myofibrillar proteins obtained from fresh and stored muscles showed a marked degradation of nebulin, a major component of the endosarcomeric cytoskeletal network, whereas the other protein constituents of myofibrils of physical properties of fish meat. AS

- 2321 Hatae (K), Yoshimatsu (F) and Matsumoto (JJ). Role of muscle fibers in contributing firmness of cooked fish. *Journal of Food Science* 55(3); 1990; 693-696

Cooked muscle tissue of five fish sp. were observed by optical and scanning electron micrography. Sp. with firm texture had thin muscle fibers with considerable heat-coagulating material between them; sp. having soft texture had thick muscle fibers with little heat-coagulating material. When the cooked muscles were compressed by Texturometer, muscle fibers of the sp. having firm texture slide or shifted over one another to a lesser extent than those of sp. with soft texture. The heat-coagulating material seemed to obstruct the displacement of the fibers. The diameter and mobility of muscle fibers are determinative of firmness of fish muscle tissue. AS

Albacore

- 2322 Perez-Martin (RI), Banga (JR), Sotelo (MG), Aubourg (SP) and Gallardo (JM). Prediction of precooking times for albacore (*Thunnus alalunga*) by computer simulation. *Journal of Food Engineering* 10(2); 1989; 83-95

A semi-empirical model of precooking of albacore was developed. This model was used in a simulation program to predict the optimal (minimum) precooking times. The simulations showed close agreement with experimental results. Regression equations were also calculated relating the precooking times with the initial total fish wt and its initial temp. These equations can easily be used in albacore canning factories without having to use a computer. AS

- 2323 Perez-Villarreal (B) and Pozo (R). Chemical composition and

ice spoilage of albacore (*Thunnus alalunga*). *Journal of Food Science* 55(3); 1990; 678-682

The protein, lipid, water and ash contents of liver and different parts of muscle tissue of albacore, *Thunnus alalunga*, were measured. Fish were caught at three different seasons and were separated into three size groups for analysis. There were significant differences among the comp. of the tissue size and season also had significant effects. Fish were stored in ice, and scales for the sensory assessment of freshness were developed for raw fish and for cooked meat. Changes in total volatile bases, trimethylamine, and adenine nucleotide decomposition products during storage in ice were measured. Sensory assessments and K index gave the highest correlation with storage time. AS

Hakes

- 2324 Beas (VE), Wagner (JR), Crupkin (M) and Anon (MC). Thermal denaturation of hake (*Merluccius hubbsi*) myofibrillar proteins. A differential scanning calorimetric and electrophoretic study. *Journal of Food Science* 55(3); 1990; 683-687, 696

Denaturation of hake (*Merluccius hubbsi*) proteins was studied with DSC by monitoring T_{max} of transitions and denaturation enthalpies. Whole muscle free of connective tissue showed two transitions (T_{max} 46.5 C and 75.3 C), and Delta H of 4.27 cal/g. Then exudative sarcoplasmic fraction showed three transitions (T_{max} 45.2 C, 59.0 C and 75.5 C) and Delta H of 3.92 cal/g. The sarcoplasmic proteins from whole hake muscle contributed to both denaturation peaks. Muscle depleted of sarcoplasmic proteins by chloride extraction showed a higher thermal sensitivity and a diminished denaturation enthalpy on the second transition. This suggested an additional effect of chloride upon action in addition to sarcoplasmic protein extraction. pH had an effect upon the native conformation of thick filament proteins, specifically myosin. AS

- 2325 Roura (SI), Montecchia (C), Lia Goldemberg (A), Trucco (RE) and Crupkin (M). Biochemical and physicochemical properties of actomyosin from pre- and post-spawned hake (*Merluccius hubbsi*) stored on ice. *Journal of Food Science* 55(3); 1990; 689-692

Biochemical and physicochemical properties of natural actomyosin (NAM) from pre- and post-spawned hake stored on ice were studied. At the beginning of storage both reduced viscosity and ATPase activities of NAM from post-spawned

hake were about 3 times higher than those of the pre-spawned ones, except for the Mg^{2+} - (Ca^{2+}) -ATPase. Higher loss of functional components during pre-spawned hake NAM purification was found compared to NAM from post-spawned fish. Reduced viscosity and Mg^{2+} - (EGTA)-ATPase activity of NAM from both pre- and post-spawned hake decreased following ice storage. SDS-PAGE patterns of NAM from pre-spawned hake showed an absence of the myosin heavy chain and the presence of a 160 kDa component at zero time of storage. No proteolysis occurred in ice-stored fish caught in both gonadal stages. AS

Sardines

- 2326 Beltran (A) and Moral (A). Effect of smoking on lipid stability in sardine (*Sardina pilchardus*, W.). *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(4); 1989; 317-321

The effect of mixed smoking (2 h at 30 C and 45 min at 75 C) on lipids in lean sardine caught in the Mediterranean Sea in March was studied. The peroxide value, 2-thiobarbituric acid index, content of nonesterified and free fatty acid were used as measures of rancidity. Changes in the fatty acid comp. in the total fat and various fat fractions were also examined. Smoking resulted in increases in the peroxide value, the thiobarbituric acid index and fatty acid content because of rancidification caused alterations in the relative percentage comp. of the different lipid fractions, with significant decreases recorded in the triacylglycerols and phospholipids along with a concomitant increase in the nonesterified free fatty acids. Fatty acid comp. also underwent changes, mainly a certain decrease in the polyunsaturated long-chain fatty acids (C_{20} and C_{22}) of the family n-3, so important in nutrition. AS

Products

Surimi

- 2327 Hamann (DD), Amato (PM), Wu (MC) and Foegeding (EA). Inhibition of modori (gel weakening) in surimi by plasma hydrolysate and egg white. *Journal of Food Science* 55(3); 1990; 665-669, 795

The effects of beef plasma hydrolysate and egg white solids were evaluated in surimi gels, using measurements of torsional shear stress and strain, bound water, cook loss and SDS-PAGE. Treatments included level of protein addition, surimi type (by sp. and grade) and cooking of

schedule. Addition of proteins, regardless of type or level of addition, significantly increased torsional shear stress and strain for all gels precooked at 60 C (90 C final cook). For gels made from low quality surimi, all levels of treatment proteins improved stress and strain for all cooking schedules and improved water holding for gels precooked at 60 C. Electrophoretic results showed a decrease in the density of the myosin heavy chain only in those gels without added proteins precooked at 60 C. AS

Surimi

- 2328 Hus (SY). Effect of frozen storage and other processing factors on the quality of surimi. *Journal of Food Science* 55(3); 1990; 661-664

A split plot design was applied to study the effect of frozen storage on the quality attributes of surimi. Gel strength of surimi products was shown to be significantly ($P < 0.01$) affected by storage and its three-way or lower order interactions with leaching, grinding, setting and heating processes. Whiteness of the fish sausages was significantly ($P < 0.01$) affected by storage and its interaction with leaching, grinding and heating processes. Significant interactions of storage with other process variables implies that the conventional single-variable at-a-time strategy is inadequate to optimize the surimi processing system. Storage conditions should be included in optimization. AS

PROTEIN FOODS

Nil

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

- 2329 Worner (M), Gensler (M), Bahn (B) and Schreier (P). Use of solid-phase extraction for rapid samples preparation in the determination of food constituents. I. Quinine in beverages. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(5); 1989; 422-425 (De).

A routine method was developed for the detn. of quinine in spirits and alcohol-free beverages. Using ion-pair chromatography quinine was separated from interfering substances by high performance liquid chromatography on a RP 18 phase and analysed by UV and fluorescence detection. In contrast to the analysis of alcohol-free beverages, sample preparation was necessary in the study of alcoholic

beverages. Solid-phase extraction on phenyl sorbents was found to be a rapid, specific and simple technique. AS

Alcoholic beverages

Beer

- 2330 Brefort (H), Guinard (J-X), Buhlert (JE) and Lewis (MJ). The contribution of dextrans to beer sensory properties. Part II. After taste. *Journal of the Institute of Brewing* 95(6); 1989; 431-435

The possibility that dextrans could contribute to the aftertaste of beer by being broken down to sweet sugars by salivary alpha-amylase after beer ingestion is investigated. The vol., pH and temp. of beer and saliva present in the oral cavity after swallowing were measured on several subjects and found adequate for the hydrolysis of beer dextrans by salivary amylase. The *in vitro* hydrolysis of a 6% dextrin solution and of commercial beers by pancreatic alpha-amylase yielded significant amounts of glucose and maltose in addition to maltotriose. Similarly, the hydrolysis of commercial beers by human saliva produced between 2.7 and 7.4 g/litre of sweet-tasting maltose and glucose, depending on the duration of the hydrolysis (30 sec to 2 min) and the amount of saliva added to 2.5 ml of beer (0.5 or 2 ml). This much sugar, because it is produced over a period of time, may not cause a detectable sweet taste but it might partially mask the bitter aftertaste of beer. AS

- 2331 Kaneda (H), Kano (Y), Kamimura (M), Osawa (T) and Kawakishi (S). Detection of chemiluminescence produced during beer oxidation. *Journal of Food Science* 55(3); 1990; 881-882

Chemiluminescence (CL) produced in beer was detected using the single photoelectron counting system. CL production did not occur in a nitrogen atm. but did occur in air and was dependent on incubation temp. It was inhibited by the addition of ascorbic acid. CL analysis should provide useful information in the study of oxidative deterioration of beer. AS

- 2332 Ragot (F), Guinard (J-X), Shoemaker (CF) and Lewis (MJ). The contribution of dextrans to beer sensory properties. Part I. Mouthfeel. *Journal of the Institute of Brewing* 95(5); 1989; 427-430

The effect of dextrans on the mouthfeel of beer was assessed using instrumental and sensory techniques. By measuring the viscosity of beer with a rheogoniometer, it was shown that beer is a Newtonian fluid, i.e. shear stress

increased linearly with shear rate. A capillary viscometer and a rheogoniometer gave viscosity measurements that did not differ significantly for six beers ranging in viscosity from 1.1 to 2.6 centipoise (cP). In carbonated beer, the amount of dextrans needed to produce an increase in viscosity detectable by judges was 52 g/litre, which raised the viscosity of 0.31 cP as measured by capillary viscometry. Since beer usually contains between 10 and 50 g/litre of dextrans, it is concluded that dextrans are not the sole determinant of beer viscosity. AS

- 2333 Suihko (M-L) and Haikara (A). Maintenance of the anaerobic beer spoilage bacteria *Pectinatus* and *Megasphaera*. *Food Microbiology* 7(1); 1990; 33-41

The preservation of *Pectinatus* and *Megasphaera* strains by freeze-drying and freezing, using different working methods and protective agents, was studied. *Pectinatus* strains isolated from beer, and all the *Megasphaera* strains, recovered well, after freeze-drying and after freezing in reducing conditions. However, the recovery of *Pectinatus* strains isolated from yeast cultures was, in most of the conditions tested, very low, and after 2 yr storage, they were almost non-viable. The only satisfactory method for these strains was rapid freezing in liquid nitrogen using 5% DMSO as protective agent. AS

Worts

- 2334 Victoria Todo, Carbonell (JV) and Sendra (JM). Kinetics of beta-glucan degradation in wort by exogenous beta-glucanases treatment. *Journal of the Institute of Brewing* 95(6); 1989; 419-422

Three commercial beta-glucanases, one bacterial (Cereflo 200L from Novo) and two fungal (Biobeta from Gist-Brocades and Filtrase from Biocon) have been studied with regard to the hydrolysis of beta-glucan in sweet and hopped wort. At temp. below 70 °C these processes follow first order kinetics with rate constants being directly proportional to the enzyme concn. The rate constant for bacterial beta-glucanase Cereflo 200L shows a negative dependence on temp. but positive with wort pH, whereas the reverse is the case for the two fungal beta-glucanases. Within the ranges of pH and temp. tested the bacterial beta-glucanase has 2-5 times the activity of the fungal ones. No evidence for synergic or competitive effects between bacterial and fungal beta-glucanases have been found. AS

Wines

- 2335 Lopez (A), Ibarz (A), Pagan (J) and Vilavella (M). Rheology of wine musts during fermentation. *Journal of Food Engineering* 10(2); 1989; 155-161

The rheological behaviour of white grape must during fermentation has been studied at 14, 18 and 22 C and is described by an exponential function relating the coeff. of viscosity with the temp. and density of the must during fermentation (and, by implication, with the residual content of fermentable sugars). AS

- 2336 Wang (J) and Mannino (S). Application of adsorptive stripping voltammetry to the speciation and determination of iron (III) and total iron in wines. *Analyst (London)* 114(5); 1989; 643-645

An analytical procedure for the detn. of iron (III) and total iron in wines based on adsorptive stripping voltammetry is described. Iron (III) was determined by using Solochrome Violet Red as chelating agent while catechol was used for the detn. of the total iron content. Each chelate was adsorbed on the hanging mercury and the reduction current of the accumulated chelate was measured. The results obtained from the application of this procedure to wine samples are discussed. AS

Non-alcoholic beverages

Coffee

- 2337 Dibert (K), Cros (E) and Andrieu (J). Solvent extraction of oil and chlorogenic acid from green coffee. Part II. Kinetic data. *Journal of Food Engineering* 10(3); 1989; 199-214

Solid-liquid extraction kinetic data for green coffee oil and chlorogenic acid were obtained using resp. hexane and methanol-water as solvents. The influence of the various extraction variables i.e. the green coffee particle diameter, the mass ratio of ground coffee to solvent and the temp., was studied. The mass transport is entirely controlled by the internal resistance of the solid. The kinetic results for the chlorogenic acid were interpreted by the diffusional model (Fick's second law) with apparent diffusivity values independent of concn. and slightly influenced by the temp. ($E_a = 9.74$ KJ/mol). For the coffee oil extraction kinetics, the same model can be used only for long time ($t > 30$ min.). The experimental values for short times ($t < 10$ min) are much longer than those predicted by

the model; this could be due to leaching phenomena. AS

Coffee

- 2338 Rivier (V), Spadone (JC) and Liardon (R). A new method for sampling the headspace of coffee infusion. *Cafe-Cocoa-The* 33(3); 1989; 171-180

This study describes a new appliance for sampling the headspace, based on the falling film evaporator principle. The characteristics of this appliance are described and the emphasis is placed on the advantages of this system over the usual techniques. The influence of the system over the usual sampling parameters on the comp. of the volatile substances in the gas given off is discussed. The limits for selecting the outputs of the solution analysed and vector gas have been recorded. The thermostatisation temp. of the liquid film is the parameter which has the greatest effect on the sampling of the volatile compounds. In the second part, the volatile comp. of a coffee infusion is analysed using the falling film appliance and is compared with the comp. given by conventional apparatus. The falling film appliance gives a much fuller volatile compound profile, with a more marked effect for the slightly volatile compounds. Furthermore, the very polar compounds, such as volatile acids, are extracted, which is not the case with the standard method. Furthermore the effect of the thermostatisation temp. of the liquid film on the concn. of volatile substances of the coffee in the headspace is also demonstrated. AS

- 2339 Rosa (MD), Barbant (D) and Lerici (CR). Changes in coffee brews in relation to storage temperature. *Journal of the Science of Food and Agriculture* 50(2); 1990; 227-235

This work was carried out to measure changes in chem. and sensory parameters of an Italian coffee brew stored at different temp. Coffee beverage bottled aseptically was tested in order to evaluate the more evident chem. and sensory changes occurring during storage. Results showed that the decrease in pH and the quality characteristics correlated with several storage temp. By the sensory evaluation it is found possible to prescribe lower limit for pH at the product deteriorated. Different scores are estimated by response surface methodology for different storage conditions. It is possible by estimation of pH at different temp. the shelf life of the product can be correlated with its storage temp. KAR

- 2340 Trugo (LC) and Macrae (R). Application of high performance

liquid chromatography to the analysis of some non-volatile coffee components. *Archivos Latinoamericanos de Nutricion* 39(1); 1989; 97-107

High performance liquid chromatography (HPLC) was applied to the analysis of caffeine, trigonelline, nicotinic acid and sucrose in Arabica and Robusta coffee. Green and roasted coffee samples were used in this study and the degradation of sucrose and trigonelline, with the formation of nicotinic acid, was followed during roasting. Caffeine did not undergo significant degradation with only 5.4% being lost under severe roasting. Sucrose was degraded rapidly during processing with light roasting producing a 97% loss and dark roasting degrading it completely. Loss of trigonelline was strongly dependent on the degree of roasting, being higher in the Robusta coffee. Trigonelline degradation was associated with nicotinic acid formation both in the Arabica and Robusta coffees as a consequence of the roasting process. Trigonelline and sucrose were determined simultaneously by partition chromatography and detection with the mass detector. Detection of caffeine was carried out using reversed phase chromatography and nicotinic acid by ion-pair reversed phase chromatography. Detection in both cases was achieved using ultraviolet detector at 272 nm or 254 nm, resp. HPLC showed adequate precision and accuracy for routine analyses. In addition, the methods used were more rapid and simple than traditional procedures. HPLC appears to be a suitable technique for quality control in the coffee industry, and for fundamental investigation on the mechanisms involved in the roasting process. AS

Fruit juices

- 2341 Douglas King (AJr) and Whitehand (LC). Alteration of *Talaromyces flavus* heat resistance by growth conditions and heating medium composition. *Journal of Food Science* 55(3); 1990; 830-832, 836

A strain of *Talaromyces flavus* var. *macrosporus* (NRRL 13641) was isolated from spoiled fruit drink and identified. It had a heat resistance (1/K) (death rate constant or decimal reduction time) of 191 min at 80 C and 6 min at 90 C with a calculated Z of 6.7 C. Several strains of *T. flavus* were tested to determine the effects on heat resistance of environmental conditions such as pH, organic acids, brix, and type of medium. Heat resistance increased with increased brix, in the heating medium. Growth on solid medium compared with liquid medium resulted in greater heat resistance. Growth at 20 C and 35 C produced ascospores with high heat resistance than growth at 25 C while those

produced at 30 °C had intermediate heat resistance. Five cultures differed significantly in heat resistance. AS

Apple juices

- 2342 McDaniel (MR), Lederer (CL), Flores (JH) and Heatherbell (DA). Effect of sulphur dioxide and storage temperature on the sensory properties of clarified apple juice. *Journal of Food Science* 55(3); 1990; 728-730, 745

'Red delicious' apple juice was processed by ultrafiltration (UF) with sulphur dioxide (min. oxidation) and without sulphur dioxide (max. oxidation) and stored for 12 months at 2 °C or 20 °C. After storage, a trained panel evaluated the juices using descriptive analysis. The treatments (plus or minus sulphur dioxide at 2 °C and 20 °C) were analyzed for pH, total acidity, soluble solids, free sulphur dioxide and total phenols. A sharp decline in total phenols in the treatments without sulphur dioxide indicated that oxidation had occurred. Apple juice with min. oxidation (+ sulphur dioxide) was scored significantly higher in fresh apple aroma than the oxidized juice (- sulphur dioxide). Juice stored at 20 °C was significantly less estery and stronger in chem. off-odour than juice stored at 2 °C. AS

Banana juices

- 2343 Khalil (KE), Ramakrishna (P), Nanjundaswamy (AM) and Patwardhan (MV). Rheological behaviour of clarified banana juice. Effect of temperature and concentration. *Journal of Food Engineering* 10(3); 1989; 231-240

The flow behaviour of concentrated (depectinized) banana juice was determined over a wide range of temp. (30-70 °C) and concn. (20-79.7 Brix), using coaxial cylinder viscometer. The results indicated that depectinized clarified and filtered banana juice behaves as a Newtonian fluid at all these concn. The effect of temp. on the viscosity of the different concn. followed an Arrhenius-type relationship. The activation energy for viscous flow was in the range 5.99-18.66 Kcal g-mol⁻¹, depending on the concn. The influence of temp. on the viscosity was more pronounced at higher concn. The effect of concn. on viscosity followed a power-law relationship at the temp. used. The rheological constants for the Arrhenius and power-law models were determined. The combined effect of temp. and concn. (20-57 Brix only) on the coeff. of dynamic viscosity can be represented, by a single equation: $\eta = 2.85 \times 10^{-11} \exp \left(\frac{30167}{T} \right) C^{2.5}$ AS

Grapefruit juices

- 2344 Nagy (S), Lee (H), Rouseff (RL) and Lin (JCC). Nonenzymic browning of commercially canned and bottled grapefruit juice. *Journal of Agricultural and Food Chemistry* 38(2); 1990; 343-346

Non-enzymic browning was monitored in canned and bottled single-strength grapefruit juice stored at 10-50 C over an 18 wk period. Browning occurred faster and developed more intensely in bottled juices than in canned juices. No browning occurred in canned juices stored at 10 and 20 C. Regression analyses of juices stored at 40 and 50 C yielded complex polynomial models to statistically define the non-enzymic browning profiles. The apparent rates of reaction at those temp. were nonuniform over time. Simplistic zero- or first order models should not be used to define non-enzymic browning of citrus juices at storage temp. exceeding 30 C. AS

FATS AND OILS

- 2345 Halling (PJ). Lipase-catalysed modification of oils and fats in organic two phase systems. *FAT Science Technology* 92(2); 1990; 74-79

Experiments have been carried out to assess the activity of lipase in two different organic phases. N

Fats

- 2346 Bosch (V) and Pantin (EL). Dietary fats. *Archivos Latinoamericanos de Nutricion* 38(3); 1988; 506-518 (Es).

Fats are important constituents of the human diet since on the one hand, they contribute to the caloric density of the diet, and on the other, they serve as vehicles of essential nutrients such as linoleic and alpha-linolenic acids, as well as fat-soluble vitamins. The existence of human populations subsisting on diets with values as low as 10% or more than 50% of the calories represented by fats, has been documented, demonstrating the great adaptability of man to a wide availability of this type of food. Nevertheless, extensive epidemiological and experimental research in relation to a frequent degenerative diseases of man, arteriosclerosis, have consistently demonstrated that the proportion of saturated fats in the diet has a positive correlation with the frequency of these alterations.

Mortality and fat availability in Latin America is consistent with these results. In consequence, and taking into consideration the present level of fat availability in the Region, it is proposed that no more than 25% of the caloric requirement should be covered by fats. Additionally, this amount of fat should have equal proportions of saturated, monounsaturated and polyunsaturated fatty acids. Cholesterol, which contained in animal fats, is not a necessary nutrient for humans, so that no min. consumption needs to be established. Daily ingestion of cholesterol should be restrained to no more than 100 mg/1,000 calories. Introduction of new fatty foods for human consumption should be preceded by a thorough investigation of the metabolic consequences. AS

Oils

- 2347 Heil (JR), Perkins (WE) and McCarthy (MJ). Use of magnetic resonance procedures for measurement of oil in French-style dressings. *Journal of Food Science* 55(3); 1990; 763-764, 884

Magnetic resonance imaging and spectroscopy techniques have been developed for measuring percentage of edible oil in French-style salad dressings. In imaging, one takes advantage of the variations in signal intensities related to differences in relaxation times of the oil and aqueous phases, and of the proportionality of projected frequencies to spatial distribution of sample constituents. In spectroscopy, percentage of oils is determined from standard curves where the integrals of oil/total spectra are correlated to known amounts of oil in standard preparations. Both procedures permit rapid, non-destructive analysis of commercially packaged dressings in unopened bottles with non-magnetic closures. Results obtained in imaging or by NMR spectroscopy were within plus or minus 2% of the expected values. AS

- 2348 Lognay (G), Dreze (P), Wagstaffe (PJ), Marlier (M) and Severin (M). Validation of quantitative procedure for the extraction of sterols from edible oils using radiolabelled compounds. *Analyst (London)* 114(10); 1989; 1287-1291

The work described in this paper is integrated in an analytical programme organised by the Community Bureau of Reference with the aim of developing reference materials certified for sterol content. Preliminary inter-comparison of methods showed that the level of agreement of the results was insufficient for certification purposes. Errors could occur in the different steps before the final detn. by gas-liquid chromatography. It was, therefore, decided to validate a quantitative procedure for the isolation of

sterols. A well defined saponification extraction method was tested using labelled sterols (^3H) cholesterol and (^3H), cholesteryl oleate and radiochemical measurements. The study was shown that total cholesterol recovery reached 100.5 plus or minus 1.4%, that cholesteryl ester was saponified quantitatively and that there were no appreciable amounts of degradation products. The procedure has been used as the basis for the certification of three reference materials and it has been shown that the saponification and extraction procedure leads to the quantitative recovery of sterols regardless of the nature of the fatty material tested. AS

Rapeseed oils

- 2349 Schnug (E) and Haneklaus (S). A rapid method for the evaluation of the glucosinolate quality of extracted rapeseed meal by total sulphur determination via X-ray fluorescence spectroscopy. *FAT Science Technology* 92(2); 1990; 57-61

Quality evaluation of double low rapeseed meal has prompted for the estimation of glucosinolates in rapeseed meal. A method has been developed for the estimation of glucosinolates employing X-ray fluorescence analysis. N.

Soybean oils

- 2350 Jaswant Singh and Bargale (PC). Effect of hydrothermal treatment on mechanical oil expression from soybean. *Journal of Food Science and Technology (India)* 27(2); 1990; 86-88

Effect of various hydrothermal treatments on the oil recovery from soybean is described. Analysis of data revealed that boiling of soybean splits and whole soybean with water for 30 min followed by sun-drying to about 7% moisture content (mc) gave the max. oil recovery of 82.40 and 84.72% in three pass pressing with specific energy consumption of 0.370 and 0.503 kWh/kg of feed resp. when compared to other treatments. Though it appears to be a bit tedious from practical point of view, considering the importance of protein as well as edible oils in Indian diets boiling of splits with water (free of hulls) followed by drying to 7% moisture may be practised for expression. AS

SPICES AND CONDIMENTS

Spices

Mustards

- 2351 Shahidi (F) and Gabon (J-E). Fate of sinigrin in methanol/ammonia/water-hexane extraction of *B. juncea* mustard seed. *Journal of Food Science* 55(3); 1990; 793-795

The individual glucosinolates present in *B. juncea* mustard seed were determined. Sinigrin (allyl glucosinolate) was the major glucosinolate of mustard seed and constituted 92.9% of the total glucosinolates. The effect of methyl alcohol/ammonia/water-hexane treatment on the concn. of glucosinolates was studied. Over 97% of sinigrin originally present in the seed was removed by the above solvent extraction system, mainly in the intact form. Breakdown products of sinigrin were quantified in the treated meal, in the extracted oil and in the polar phase (gums). Aglycon products were allyl cyanide, allyl isothiocyanate and 2,3-epithiopropene cyanide. Sugar breakdown products were glucose, thioglucose, thioglucose dimer and furfuryl alcohol. Desulfosinigrin was a minor decomposition product and might have acted as an intermediate in the decomposition of sinigrin. AS

Pepper

- 2352 Verghese (J). Add a touch of green. *Food* 11(11); 1989; 43, 45

Processing of green pepper and factors affecting its flavour are briefly described. SYR

SENSORY EVALUATION

Nil

FOOD STORAGE

Nil

INFESTATION CONTROL AND PESTICIDES

Insects

- 2353 Karnatak (AK), Khare (BP) and Johari (RK). Relative toxicity of some synthetic pyrethroid insecticides against *Tribolium castaneum* (Herbst). *Pesticides* 24(2); 1990; 21-25

The lethal concn. (LC) and lethal time (LT) values of deltamethrin, cypermethrin, fenvalerate, permethrin, bioallethrin, s-bioallethrin, d-(cis trans) phenothrin and tetramethrin were determined for *Tribolium castaneum* using "Dry film Technique". On the basis of both LC and LT values, deltamethrin was found the best amongst synthetic pyrethroids. The order of toxicity was as follows: deltamethrin > cypermethrin > permethrin > fenvalerate > d-(cis-trans) phenothrin > (LC 90 vs-bioallethrin > bioallethrin and tetramethrin. (LC 90 values being 0.0196850 p.p.m., 0.060595 p.p.m., 0.200400 p.p.m., 0.30 10 p.p.m., 1.4128 p.p.m.) (0.910620 p.p.m., 2.4147 p.p.m. and 4.0721 p.p.m. resp.). KAR

Pesticides

Phosphines

- 2354 Bolter (CJ) and Chefurka (W). The effect of phosphine treatment on superoxide dismutase catalase, and peroxidase in the Granary weevil, *Sitophilus granarius*. *Pesticide Biochemistry and Physiology* 36(1); 1990; 57-60

Studies with the fumigant insecticide phosphine have previously shown that a direct relationship exists between oxygen concn. during fumigation and insect mortality. Present study with *Sitophilus granarius* demonstrates that phosphine treatment has a significant effect on the enzymes involved in oxygen defence. Activity of superoxide dismutase was elevated and activities of catalase and peroxidase were reduced resulting in an accumulation of hydrogen peroxidase and the consequent production of the hydroxyl radical (OH), a powerful oxidizing agent. These results indicate that insect mortality could be attributed to accumulation of oxygen derived free radicals which eventually destroy the cell integrity. NGKK

- 2355 Qasim Chaudhry (M) and Price (NR). A spectral study of the biochemical reactions of phosphine with various haemproteins. *Pesticide Biochemistry and Physiology* 36(1); 1990; 14-21

Spectral changes due to phosphine exposure in purified haemproteins such as haemoglobin, myoglobin, catalase and peroxidase isolated from different biological sources were studied. Slow de-oxygenation of both the oxygen carrier proteins, (haemoglobin and myoglobin) resulted from treatment with phosphine. There was no significant spectral change in catalase or peroxidase. Hence phosphine has higher affinity for oxygen than haemoglobin or myoglobin. The toxic action of phosphine based on its reducing and deoxygenating properties is suggested. KAR

BIOCHEMISTRY AND NUTRITION

- 235 Blenford (D). Functional proteins. *Food* 11(10); 1989; 55-59

The functional properties of proteins which influence the texture and organoleptic properties of foods are described briefly. The factors influencing the functional properties and common means of achieving enhancement of protein functionality are tabulated. The flavour binding capacity of proteins is also briefly mentioned. SYR

- 2357 Chase (D). Is HVP safe ? *Food* 11(10); 1989; 67-69

Chloropropanols, the probable harmful components produced during the preparation of hydrolysed vegetable protein and their quantitative detn. are described briefly. SYR

- 2358 Elmadfa (I), Siewert (RC) and Wachal (T). Adaptability of rat's organism to the utilisation of gamma-tocopherol in a generation study. 1. Tocopherol status and biotransformation of gamma-tocopherol to alpha-tocopherol. *FAT Science Technology* 92(1); 1990; 37-44 (De).

- 2359 Grekas (N), Calokerinos (AC) and Hadjiioannou (TP). Determination of thiamine using continuous flow molecular emission cavity analysis. *Analyst* (London) 114(10); 1989; 1283-1286

A continuous flow method for the detn₅ of thiamine hydrochloride (20.0-240.0 ug ml⁻¹, 5.9×10^{-5} - 7.1×10^{-4} M) is described. The sample was mixed with an excess of orthophosphoric acid and the hydrogen sulphide evolved was transferred continuously into the cavity to generate a mol. emission of S₂. The analysis is completely automated, requires no sample pre-treatment and samples can be analysed at a rate of 30 samples h⁻¹ with a relative error of 1-2%. The method was evaluated by carrying out an interference

study with common excipients and other water-soluble vitamins, a recovery study and by the analysis of commercial formulations. Results compared well with those obtained using the official method. The method was also applied to content uniformity tests. AS

- 2360 Labuza (TP) and Massaro (SA). Browning and amino acid loss in model total parenteral nutrition solutions. *Journal of Food Science* 55(3); 1990; 821-826

The kinetics of browning and amino acid loss due to the Maillard reaction was studied in model total parenteral nutrition (TPN) systems containing glucose and either lysine, tryptophan, and cysteine alone or in combination. Cysteine systems showed the highest molar rate of browning while lysine showed the slowest rate. The molar rate of browning with all amino acids combined was significantly less than that of the sum of the individual rates, indicating interactions or inhibition. TPN electrolytes had no significant effect on the browning rate. The amino acids showed an initial rapid pseudo-first-order decrease in concn. followed by an apparent recovery and stabilization at an equilibrium concn. of about 60-80% of the original level. AS

- 2361 Omogbai (FE). Lipid composition of tropical seeds used in the Nigerian diet. *Journal of the Science of Food and Agriculture* 50(2); 1990; 253-255

In this paper the lipid and fatty acid comp. of some Nigerian seeds have been investigated they constitute an important component of the local population. The samples used were melon (*Colocynthis vulgaris*), ogbono (*Irvingia gabonensis*), ukpo (*Mucuna sloanei*), achi (*Barchystegia nigra*), soybeans (*Glycine soja*), African oil beans (*Pentaclethra macrophylla*), white beans (*Phaseolus vulgaris*) and brown beans (*Vigna unguiculata*) and standard methods were adopted for the analysis. KAR

Biochemistry

- 2362 Akita (EM) and Nakai (S). Lipophilization of Beta-lactoglobulin. Effect on hydrophobicity, conformation and surface functional properties. *Journal of Food Science* 55(3); 1990; 711-717

Beta-lactoglobulin was chemically modified by attaching different levels of stearic acid, and the effect on hydrophobicity, emulsifying and foaming properties was investigated. Incorporation of the hydrophobic ligands led to increased hydrophobic interactions, resulting in a

decreasing solubility with extent of incorporation. Surface hydrophobicity measurements showed that the two fluorescence probes 8 anilinonaphthalene-1-sulphonate (ANS) and cis-parinaric acid (CPA) used were not equivalent. Some improvement of emulsifying and foaming properties was observed at low and medium levels of incorporation which decreased as the extent of fatty acid attachment further increased. High solubility and ANS surface hydrophobicity were both increased. High solubility and needed for the best emulsifying properties. AS

- 2363 Akita (EM) and Nakai (S). Lipophilization of Beta-lactoglobulin. Effect on allergenicity and digestibility. *Journal of Food Science* 55(3); 1990; 718-723

Beta-lactoglobulin was chemically modified by covalent attachment of different levels of stearic acid and the effect on allergenicity and digestibility of the protein was evaluated. A decreased in vitro digestibility was observed with extent of lipophilization (stearic acid incorporation). Increased ability to elicit immunoglobulin E (IgE) antibodies, determined by heterologous passive cutaneous anaphylaxis, was observed at low lipophilization (attachment of fatty acid). Medium level of lipophilization decreased this ability and at high lipophilization the ability to elicit IgE antibodies and was almost destroyed. Low and medium lipophilization increased immunoglobulin G (IgG) binding ability as measured by enzyme-linked immunosorbent assay. High lipophilization decreased the IgG binding ability. AS

- 2364 Klein (T) and Knorr (D). Oxygen absorption properties of powdered iron. *Journal of Food Science* 55(3); 1990; 869-870

Powdered iron with a particle size $< 10 \mu\text{m}$ was used as the basic oxygen scavenging system in air-filled glass containers. The scavenger was tested unpackaged or sealed in polyethylene pouches. Scavenger concn. and packaging system affected rates of oxygen removal. Relative humidity markedly influenced the effectiveness of the oxygen scavenger system. At 98% RH, oxygen concn. in air-filled containers reached 1.6% after 21 h, while one-half of the oxygen remained at 65% RH. Overall, the data suggest = 1 to 1.5% oxygen removed per h at 22 plus or minus 2 C depending on the RH values of the system. AS

TOXICOLOGY

- 2365 Alink (GM), Kuiper (HA), Beems (RB) and Koeman (JH). A study

on the carcinogenicity of human diets in rats. The influence of heating and the addition of vegetables and fruit. *Food and Chemical Toxicology* 27(7); 1989; 427-436

The influence of dietary factors such as total comp., thermal processing, and the addition of vegetables and fruit on the tumour rate in rats was studied in a long-term exp. Groups of 50 male and 50 female Wistar rats were fed one of the following diets; a semi-synthetic animal diet (A control); diet A to which vegetables and fruit were added (B); an uncooked human diet (meat, bread and eggs) supplemented with semi-synthetic compounds (C); diet C with fried or baked products (D); a complete human diet consisting of heated products, vegetables and fruit prepared according to mean consumption figures in the Netherlands (E). The animal diets (A and B) contained 26.0 energy (E)% protein, 21.6 E% fat, 52.4 E% carbohydrate and 10.7% (w/w) fibre. The human diets contained 13.2 E% protein, 40.6 E% fat, 46.2 E% carbohydrate and 5% (w/w) fibre. The rats were fed *ad lib.* for 142 wk. In males and females fed human diets (C, D or E) hepatocellular vaculization was observed. Male rats (but not female) fed the human diet had a significantly ($P < 0.02$) higher incidence of epithelial tumours than those fed the animal diet. This increase was mainly due to tumours of the pituitary and thyroid. Frying and baking of food products (diet D) and the addition of vegetables and fruit (diet E) induced minor differences in tumour rate, but they were not statistically significant. AS

- 2366 Hermann (A) and Schupbach (MR). The proof of the reliability of the food control analysis after the Chernobyl accident. *Zeitschrift Fuer Lebensmittel-Untersch und Forschung* 189(5); 1989; 413-417 (De).

The radioactive contamination of the food consumed by the inhabitants of Basel after the Chernobyl fallout has been continuously controlled by our lab. The activity of ingested Cs-137 has been estimated and is compared here with the activity obtained through whole body counts. The satisfactory correlation between calculated and observed body activities enables an exact estimation of the people's dosis applying the same model and demonstrate the reliability of the food control analysis. AS

- 2367 Scheffrahn (RH), Hsu (RC) and Su (NY). Fluoride residues in frozen foods fumigated with sulphuryl fluoride. *Bulletin of Envi onmental Contamination and Toxicology* 43(6); 1989; 899-903

Sulphuryl fluoride, is used extensively as a fumigant

for structural pest control. A recent study (Scheffrahn et al. 1988) demonstrated that exposure of non-perishable, unprotected food commodities to sulphuryl fluoride (SF) results in permanent residue formation of stable, water-soluble fluorides, detected as anionic F. The permanent residue potential from exposure of perishable commodities to SF is a concern during the fumigation of structures such as food establishments and homes which may contain large stores of frozen foods. Removing frozen foods from the structure may not be practical or even feasible. Therefore, a need exists to determine if representative foods, exposed to SF while stored in a freezer, a mass detectable increases in extractable fluoride (F). This study was conducted to determine residual F levels in unprotected and polyethylene bag-protected frozen foodstuffs fumigated with SF. AS

Mycotoxins

- 2368 Whitehead (MP) and Flannigan (B). The *Fusarium* mycotoxin deoxynivalenol and yeast growth and fermentation. *Journal of the Institute of Brewing* 95(6); 1989; 411-413

At a concn. of 50 ug ml^{-1} medium, the trichothecene mycotoxin deoxynivalenol (DON) caused reductions of up to 15% in cell number, dry mass and total protein during growth of *Saccharomyces cerevisiae* for 24 h at 25 C, but had little effect on viability of cultures. During fermentation of glucose-amended Wickerham medium at 16 C, the presence of $20 \text{ ug DON ml}^{-1}$ had no effect on the rate of attenuation of glucose or production of ethanol, but lower concn. of the related mycotoxin diacetoxyscirpenol (DAS) strongly affected growth and also caused an initial lag during fermentation. AS

Aflatoxins

- 2369 Shepherd (MJ), Mortimer (DN) and John Gilbert). A review of approaches to the rapid analysis of aflatoxins in foods. *Journal of the Association of Public Analyst* 25(4); 1987; 129-142

An overview of methods of analysis for aflatoxins is presented, with an emphasis on practical performance. Currently used TLC and HPLC procedures are outlined and contrasted and recent developments in immunologically-based methods are reviewed in detail. Enzyme-linked immunosorbent assay, "card" tests and affinity column methods are described and compared. AS

FOOD LAWS AND REGULATIONS

Nil

ERRATA

Item 2088 on Page 736 of Food Technology Abstracts, Vol. 25 No.(9-10), Sept.- Oct. 1990 issue is incomplete. The item which is complete is reproduced below

2088 Mnzava, (NA) and Olsson, (K). Studies on tropical vegetables Part I.: Seed amino, fatty acid and glucosinolate profile of Ethiopian mustards (*Brassica carinata* Braun). Food Chemistry. 35(3) 1990; 229-235

Amino acid analysis in seed of local Ethiopian mustard (*Brassica carinata* Braun) show high levels of (in g/100 g protein) glutamic acid (20.7), arginine (10.8) and proline (6.5), while histidine (2.9) and tyrosine (2.5) were the lowest. Variation between selections existed. 'Mulio giant' has consistently high values while 'CRRS-5' and 'Figiri white' were lower. Mean amino acid contents in local Ethiopian mustard were comparable to that of rape 'Double-zero'. Crude protein in mustard seed (47.6%) was higher than in 'Double-zero' (38.7%). While erucic acid (40.6%) was a major fatty acid in Ethiopian mustard and to a lesser extent oleic, linoleic and linolenic acids. 'Double-zero' showed the opposite trend (despite similarities in iodine and saponification numbers). Ethiopian mustards had higher glucosinolates (79 umoles/g), mainly sinigrin (77.2 umoles/g), and lower gluconapin and progoitrin than 'Double-zero', whose glucosinolate content was 10 umoles/g. Although 'Figiri white' had no gluconapin, it had the highest sinigrin (99 umoles/g) compared to 58 umoles/g in 'Mulio giant'. AS

